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## PRELIMINARY NOTES ON THREE ROTS OF JUNIPER[1]

G. G. HEDGCOCK AND W. H. LONG

(WITH PLATES 64 AND 65, CONTAINING 15 FIGURES)

On account of the increasing scarcity of the common red cedar (*Juniperus virginiana*), other species of juniper which have heretofore been considered worthless or of very little economic value are becoming commercially important. Any disease, therefore, which seriously injures any species of juniper that reaches a size large enough to be used even for fence posts, is of sufficient importance to demand attention.

In addition to the three rots caused by the species of *Fomes* which are discussed in this paper, there are also other rots of juniper which do much damage, but lack of sufficient data and material at this time on these diseases have made it necessary for the writers to limit this article to three heart rots of living junipers, namely: white rot, caused by *Fomes juniperinus;* yellow rot, caused by *F. earlei;* and stringy brown rot, caused by *F. texanus.*

The distribution and characteristics of the white rot, and the damage done by it to the red cedar have been previously noted by von Schrenk (Two Diseases of Red Cedar, Caused by *Polyporus Juniperinus* n. sp., and *Polyporus Carneus* Nees, Bull. 21, U. S. Dept. Agr. Veg. Phys. and Path.). The characteristics and effects of the other two rots are here reported for the first time;

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technical descriptions of the sporophores, however, have been given by Murrill in North American Flora **9**: 104, 107. 1908.

The junior author is responsible for the descriptions given, and for the micro-chemical studies of the rots reported in this article. The field notes on *Fomes earlei* and *F. texanus* were made by both authors.

## WHITE HEART ROT OF JUNIPER

FOMES JUNIPERINUS (Schrenk) Sacc. & Syd. Sacc. Syll. **16**: 151. 1902

*Polyporus juniperinus* Schrenk, Bull. U. S. Dept. Agr. Veg. Phys. and Path. **21**: 9. 1900.

*Pyropolyporus juniperinus* (Schrenk) Murrill, Bull. Torrey Club **30**: 116. 1903.

Rot white, or brownish-white in partially rotted areas, forming holes in the heart wood. These holes have white borders consisting of delignified wood tissues, which rather abruptly change both in structure and color until the normal condition of the sound wood is reached. Long, white fibers of pure cellulose extend into the cavity, which usually contains a yellowish mass, consisting of wood fibers intermixed with the mycelium of the fungus. The holes vary from one to three inches in diameter and extend longitudinally in the tree for several inches (4–6); or successive holes may coalesce into one long hole; or there may be several holes in one cross section. The white delignified tissue that borders the holes is firm and appears to be sound, but a microscopic examination shows that the middle lamellae and medullary rays have disappeared, leaving the individual tracheids with walls of pure cellulose. The bordered pits are also corroded until they appear as regular perforations in the tracheids.

Later the delignified wood is gradually destroyed, thus producing the holes in the trees. There seems to be a radial limit to the activity of this fungus as the holes increase in size up to a certain diameter, beyond which all enzymotic action stops and the hole ceases to grow in diameter, but may continue to grow longitudinally. Around the edges of such holes the delignification and the absorption of the resulting cellulose seem to progress at about the same rate, as the attacked wood gives only a faint reaction for pure cellulose. This description is made from a portion of the type material of the rot.

Pileus woody, ungulate, length 3–7 cm., breadth 5–9 cm., thick-

ness 2–4 cm., narrowly attached; surface tomentose, sulcate, reddish-brown to dark brown; margin obtuse, velvety, melleous to ferruginous, plane below; context woody, reddish-brown, 0.5 to 2 cm. thick; tubes indistinctly stratified, 0.5 to 1 cm. long each season, melleous within, reddish-brown in older layers, mouths circular, 2–3 to a millimeter, edges obtuse, entire, melleous to fulvous; spores very abundant, fulvous, smooth, spheroid to broadly ellipsoid, somewhat angular, 5–6 × 6–7 μ, cystidia few, nearly colorless, 100 × 20 μ, pointed (in specimen at hand), somewhat encrusted. This description is drawn from a specimen collected at Sparrow Point, Md., by Dr. Perley Spaulding in 1908.

TYPE LOCALITY: Tennessee.

HABITAT: Trunks of living trees of *Juniperus virginiana* L.

DISTRIBUTION: Tennessee, Kentucky, and Maryland, probably more or less prevalent throughout range of host. Only 3 or 4 sporophores of this fungus have ever been reported, but the rot is known to occur in the states mentioned. The sporophores form from a dense whitish weft of mycelium, which has grown out through the wood of a dead branch or from a knot hole.

## YELLOW ROT OF JUNIPER

FOMES EARLEI (Murrill) Sacc. & D. Sacc. Sacc. Syll. **17**: 119. 1902

*Pyropolyporus Earlei* Murrill, Bull. Torrey Club **30**: 116. 1903.

Rot light brown, slightly paler than the unchanged heart wood, forming longitudinal holes from one to several inches in diameter and two to several inches in length; holes, as a rule, partially filled with undecomposed wood particles which are often matted together by the light yellow mycelium of the fungus; rotted areas usually abruptly limited by annual rings, thus making longitudinal tube-like holes several times longer than broad; both heart and sap wood may be attacked, but usually only the heart wood.

The enzym from this fungus attacks the medullary rays and the walls of the bordered pits, gradually enlarging the pits until only clear round holes are left. These holes gradually coalesce, and the tracheids are thus divided longitudinally, leaving jagged strips of tissue, the uncorroded corner remnants of the walls where three or more tracheids joined. The enzym does not delignify the walls of the tracheids but corrodes the tissues as a whole; neither are the middle lamellae destroyed as in the white rot of juniper.

Pileus woody, broadly ungulate to semi-cylindrical in old sporo-

phores, broadly attached, plane to slightly convex below, length 2–12 cm., breadth 3–12 cm., thickness 2–8 cm.; surface concentrically sulcate, very rimose, fulvous to brownish-black; margin broad, obtuse, luteous to dark brown, tomentose; context woody, fulvous, at length becoming dark reddish-orange, 1 to 1.5 cm.; tubes faintly or not at all stratified, from 1 cm. long in very young sporophores to .2–.5 cm. in older ones each season, 1 to 2 to a millimeter, yellow within during first season, later becoming brick-red, mouths circular, yellow, edges obtuse, thin; spores very abundant, spheroid, broadly ovoid or ellipsoid, smooth, 5–6 × 6–8 $\mu$, pale yellow, cystidia apparently none.

TYPE LOCALITY: El Capitan Mountains, New Mexico, at an altitude of 2100 meters.

HABITAT: Trunks of living trees of *Juniperus monosperma* (Eng.) Sarg., *J. utahensis* (Eng.) Lemm., and *J. sabinoides* (H.B.K.) Sarg.

DISTRIBUTION: Texas, New Mexico (very common), Arizona, and Colorado.

The sporophores of this fungus are fairly common wherever the rot is found, and are attached directly to the bark on areas where the rot has reached the surface of the tree. They are located usually within ten feet of the ground in narrow longitudinal furrows or depressions in the trunk. The damage to the trees is often extensive; in some instances the trees are weakened to such an extent, especially near the butt, that they bend or break at this point; in any event a tree thoroughly infected by this fungus is unfit for commercial purposes. This rot is apparently rare in Texas, as only one sporophore has been found. It is replaced here by *Fomes texanus*.

### STRINGY BROWN ROT OF JUNIPER

**Fomes texanus** (Murrill) Hedgc. and Long

*Pyropolyporus texanus* Murrill, N. Am. Fl. **9**: 104. 1908.

Rot reddish-brown, light brown adjacent to the sound wood, characterized by layers of badly rotted wood alternating with more or less sound layers. The rotted regions correspond approximately to the spring wood of the annual rings and the sound layers to the summer wood, thus making a species of stringy brown rot arranged in concentric rings in a cross section view.

In the earlier stages of the rot, the wood is light brown and under the hand lens is seen to consist of small pockets of rotting tissue in the spring wood, thoroughly permeated with the fulvous mycelium of the fungus; at this stage the rot somewhat resembles that produced by *Polystictus abietinus*. As the rot advances, these pockets coalesce longitudinally, thus destroying more or less completely the spring wood.

This rot, from the material at hand, does not seem to produce holes in the tree but leaves the wood in the alternate-layered condition above described. Later, certain fungi, especially species of *Poria*, may attack and completely destroy the diseased wood, thereby leaving the tree in a more or less hollow condition. This fungus usually attacks only the heart wood, but also extends into the sap wood, a condition which always arises wherever a sporophore is formed. The entire heart wood for many inches may be attacked and take on the characteristic reddish-brown layered appearance previously noted.

A micro-chemical examination of the diseased wood shows no delignification, but the enzym seems to attack first the resinous or gum-like contents of the medullary rays, then their walls and thence passes to the tracheids, where small areas in the spring wood are destroyed. The middle lamellae are not attacked by the enzym, but the walls of the tracheids seem to be uniformly corroded, the relative proportion of lignin, cellulose, etc., in their walls changing not at all. This description was made from material collected at Austin, Texas (type locality), on *Juniperus sabinoides*, but the characteristics of the rot are the same on all the hosts examined.

Pileus woody, more or less ungulate to sub-cylindrical in very old specimens, broadly attached, plane to slightly convex below; length 3–13 cm., breadth 4–11 cm., thickness 2–6 cm.; surface, when young, tomentose, melleous, smooth, becoming sulcate by the yearly accretions, older portion reddish-brown to black, glabrate, strongly rimose; margin very obtuse, rounded, melleous, tomentose, smooth; context woody, melleous to dark luteous, zonate, 1.5–2.5 cm. thick; tubes evenly but faintly stratified, 3 to 5 mm. long each season, concolorous without luster, mouths circular, 4–5 to a millimeter, edges obtuse, entire, melleous to fulvous; spores rarely found, globose, smooth, 3–4 $\mu$, cystida none, hyphae brown, 5–7 $\mu$ in diameter.

TYPE LOCALITY: Austin, Texas, on *Juniperus sabinoides*.

HABITAT: Trunks of living trees of *J. sabinoides*, *J. monosperma*, and *J. utahensis*.

DISTRIBUTION: Southwest Texas, New Mexico, and Arizona. Very common in Texas and New Mexico.

The sporophores are attached to the bark, usually within ten feet of the ground, and occur on dead tissue where the fungus has grown outward from the heart wood into the bark, thereby killing the living tissues of the tree, at this point both sap wood and bark are permeated with the reddish-yellow mycelium of the fungus. The sporophores are usually located in the longitudinal depression or furrows which are found on most junipers. They were rarely found associated with an old dead branch or knot hole. The damage done by this rot in certain localities is very great; often many mature and over-mature trees are weakened at the butt to such an extent that they bend, split, and flatten near the ground and either fall or remain in a leaning position; later other fungi or fire kills the trees outright or hollows them out so that they are easily blown down. Even when the injury is not sufficient to produce such damage, the wood of many trees attacked by this fungus is rotted to such an extent that it is unfit for commercial purposes.

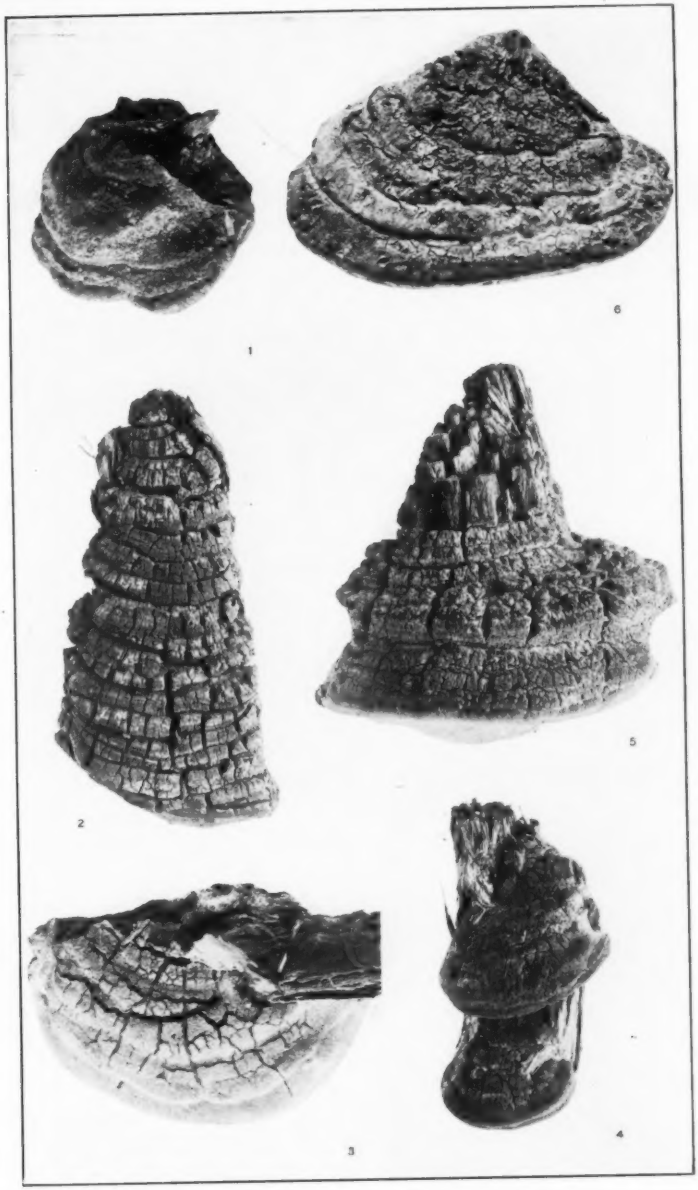
OFFICE OF INVESTIGATIONS IN FOREST PATHOLOGY,
BUREAU OF PLANT INDUSTRY,
WASHINGTON, D. C.

EXPLANATION OF PLATE LXIV

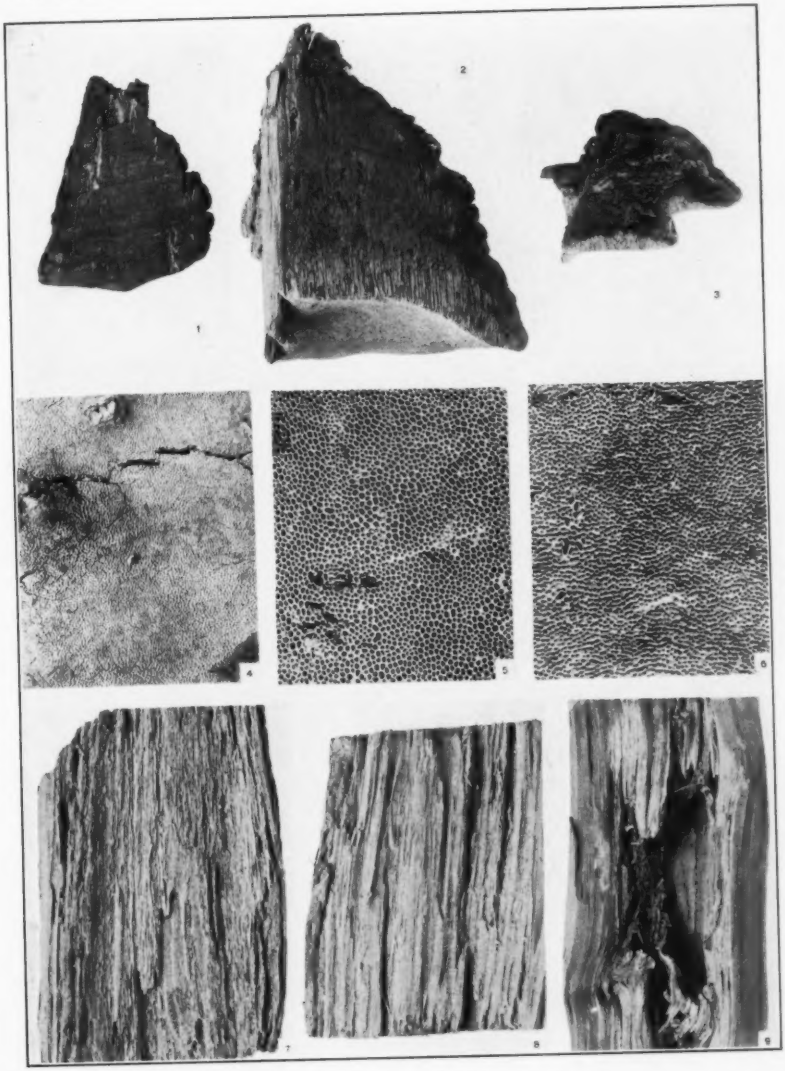
Fig. 1. Sporophore of *Fomes juniperinus*. ×½.
Fig. 2. Sporophore of *Fomes texanus*, old and weathered specimen. × ½.
Fig. 3. Sporophore of *Fomes texanus*, young specimen two or three years old. × ½.
Fig. 4. Sporophore of *Fomes carlei*, young specimens one or two years old. × ½.
Fig. 5. Sporophore of *Fomes carlei*, old and weathered specimen. × ½.
Fig. 6. Sporophore of *Fomes carlei*, young specimen three or four years old. × ½.

EXPLANATION OF PLATE LXV

Fig. 1. *Fomes texanus*, longitudinal section of sporophore. ×½.
Fig. 2. *Fomes carlei*, longitudinal section of sporophore. ×½.
Fig. 3. *Fomes juniperinus*, longitudinal section of sporophore. ×½.
Fig. 4. *Fomes texanus*, surface of hymenium showing pores. ×2.
Fig. 5. *Fomes carlei*, surface of hymenium showing pores. ×2.
Fig. 6. *Fomes juniperinus*, surface of hymenium showing pores. ×2.
Fig. 7. *Fomes texanus*, longitudinal section of wood showing rot. ×½.
Fig. 8. *Fomes carlei*, longitudinal section of wood showing rot. ×½.
Fig. 9. *Fomes juniperinus*, longitudinal section of wood showing rot. ×¼.




POLYPORES THAT ATTACK JUNIPER



POLYPORES THAT ATTACK JUNIPER

# THE GENUS LASIOSPHAERIA

FRED J. SEAVER

(WITH PLATES 66 AND 67, CONTAINING 37 FIGURES)

In working over the Trichosphaeriaceae preparatory to a monograph of the family a number of points of interest have arisen relating both to genera and species. In order to bring out some of these points the North American species of the genus *Lasiosphaeria* are here described and illustrated.

The genus *Lasiosphaeria* was founded in 1863 by Cesati and De-Notaris, with *Sphaeria ovina* Pers. as type of the genus. In 1869 Fuckel took up the genus *Leptospora* Rabenh. but used it in a different sense from that in which it was originally used by Rabenhorst,[1] including *Sphaeria ovina* Pers. in this genus. In the diagnosis of the genus *Leptospora* Fuckel states: "Diese Gattung steht, was den Sporenbau anbelangt, *Lasiosphaeria* nahe, nur sind bei *Leptospora* die Sporen ohne Querwänden." In the members of this group of plants it is very difficult to rely upon the septation of the spores as a basis for generic distinction since in many species the spores are nonseptate when young and it is difficult to find mature spores, but when mature spores are found, they are often delicately separate. The type of the genus *Lasiosphaeria* as usually collected has nonseptate vermiform spores while rarely plants of the same species are found with some of the spores enlarged at one end into an ellipsoid head and becoming one or more septate. Other species of the genus which usually contain nonseptate spores occasionally have the spores septate without enlargement, the number of septa varying with the species. While Fuckel in his diagnosis of the genus *Leptospora* regards the spores as nonseptate he includes in the genus species in which, as described above, the spores are often septate. The genus *Leptospora* of Fuckel is therefore regarded as a synonym of *Lasiosphaeria*, in which genus the presence or absence of septa is a variable character.

[1] Hedwigia 1: 116. 1857.

Since the genus *Lasiosphaeria* was founded numerous species have been placed in the genus which more properly belong with other genera of the Trichosphaeriaceae. The genus, therefore, as here treated is used in a somewhat restricted sense to include the species which, in the judgment of the writer, properly belong here. While as a rule the members of the genus have hairy perithecia in a few the perithecia are not conspicuously hairy at least when old. The delicate walled, long and usually vermiform spores constitute one of the most valuable diagnostic characters of the genus.

So far as the form and variability of the spores is concerned this group shows a very close relationship with the Fimetariaceae (Sordariaceae), the chief difference being in the consistency of the perithecia which may be due in part at least to the difference in substratum. Referring to *Pleurage albicans*, Griffiths[2] says: "A very interesting species from the fact that mature spores are seldom met with. . . . Often one may find asci in which the spores are slightly enlarged at the end, but it is seldom that they can be found in even the olive-green stage. In the vast majority of cases they are simply the long cylindrical curved guttulate structures that are the forerunners of the spores of so many of the species of the genus." The same statement will apply equally well to several species of the genus *Lasiosphaeria* as shown by the illustrations accompanying the present paper. While *Pleurage lutea* (Ellis & Ev.) Kuntze which occurs on wood is commonly placed with the Fimetariaceae it is doubtful whether it should not more properly have been placed in the genus *Lasiosphaeria* with the family Trichosphaeriaceae. As a whole the present genus shows a rather close relationship with the genus *Pleurage* of the Fimetariaceae.

As the present paper is preliminary to a treatment of the family Trichosphaeriaceae in North American Flora, any data regarding additional species in the genus *Lasiosphaeria* or notes regarding the extension of range of distribution of any of the species here described will be very gladly received.

[2] North American Sordariaceae. Mem. Torrey Club 11: 80. 1901.

LASIOSPHAERIA Ces. & De-Not. Comm. Soc. Critt. Ital. 1: 229. 1863

*Leptospora* Fuckel, Symb. Myc. 143. 1869. ?Not *Leptospora* Rabenh. 1857.

Perithecia superficial, free or seated in a subiculum consisting of a black or dark brown mycelial growth, cylindric, globose, ovoid or pyriform, brownish or blackish or occasionally light colored by reason of the pale hairs with which they are clothed, or clothed with black hairs; hairs rigid or flexuous, few or abundant; asci cylindric or clavate, usually 8-spored; spores very variable, usually vermiform with a delicate appendage at either end, hyaline or colored a part of their length, or often with an enlarged head which may be hyaline or dark brown in color, simple at first but often becoming at maturity delicately septate; septa variable in number or in some species constant.

Type species, *Sphaeria ovina*.

Spores uniformly hyaline or subhyaline throughout their entire length.
- Perithecia clothed with light colored hairs giving them a grayish or yellowish appearance.
  - Hairs scant, flexuous, varying from yellowish to whitish. 1. *L. mucida.*
  - Hairs abundant, rigid, giving the perithecia a spiny appearance.
    - Neck of the perithecia simple. 2. *L. strigosa.*
    - Neck of perithecia compound, four-parted. 3. *L. stuppea.*
- Perithecia clothed with black hairs.
  - Perithecia subglobose to pyriform.
    - Hairs abundant, rigid, giving the perithecia a spiny appearance.
      - Spores 50–80 × 6 μ, becoming 7-septate.
        - Plants occurring on wood. 4. *L. hispida.*
        - Plants occurring on soil. 5. *L. terrestris.*
      - Spores 65–70 × 3–4 μ, becoming many-septate. 6. *L. multiseptata.*
    - Hairs scant, spores small, 20 × 4 μ. 7. *L. globularis.*
  - Perithecia flat below, depressed-conic. 8. *L. jamaicensis.*

Spores dark brown a part of their length.
- Colored portion of spore enlarged into an ellipsoid head. 9. *L. newfieldiana.*
- Colored portion of spore not enlarged. 10. *L. dichroöspora.*

### 1. **Lasiosphaeria mucida** (Tode)

*Sphaeria mucida* Tode, Fungi Meckl. **2**: 16. 1791.
*Sphaeria mutabilis* Pers. Ic. Descr. Fung. 24. 1798.
*Sphaeria ovina* Pers. Syn. 71. 1801.
*Leptospora ovina* Fuckel, Symb. Myc. 143. 1869.
*Lasiosphaeria ovina* Ces. & De-Not. Comm. Soc. Critt. Ital. **1**: 229. 1863.

Perithecia superficial, gregarious or often crowded, nearly globose with a more or less prominent ostiolum, about .5 mm. in diameter, clothed externally with a fine white or yellowish tomentum except the ostiolum which appears as a black dot, the entire perithecium becoming darker with age, at length brownish or blackish, hard and carbonaceous; asci cylindric or clavate, 8-spored, surrounded by a yellow mucilaginous substance, 150–200 × 15–20 μ; spores cylindric, or vermiform, usually abruptly curved near the lower end, hyaline, simple or indistinctly septate or pseudoseptate, often with a delicate appendage at either end and occasionally with one end swollen forming a conspicuous head, 35–50 × 3–5 μ (*pl. 2, f. 1–3*).

On rotten wood.

TYPE LOCALITY: Mecklenburg, Germany.

DISTRIBUTION: Maine to Colorado, Florida and Louisiana.

ILLUSTRATIONS: Tode, Fung. Meckl. *pl. 10, f. 82;* Pers. Ic. Descr. *pl. 7, f. 6.*

EXSICCATI: Ellis, N. Am. Fungi *892.*

### 2. LASIOSPHAERI STRIGOSA (Albert. & Schw.) Sacc. Syll. Fung. **2**: 201. 1883

? *Sphaeria canescens* Pers. Obs. Myc. **8**: 67. 1796.
*Sphaeria strigosa* Albert. & Schw. Consp. Fung. 37. 1805.
*Leptospora strigosa* Fuckel, Symb. Myc. 144. 1869.
? *Lasiosphaeria canescens* Karst. Myc. Fenn. **2**: 162. 1873.
?*Sphaeria sublanosa* Cooke; Cooke & Ellis, Grevillea **7**: 41. 1878.
? *Metasphaeria sublanosa* Sacc. Syll. Fung. **2**: 165. 1883.
*Lasiosphaeria Hystrix* Ellis & Ev. Proc. Acad. Nat. Sci. Phil. **1894**: 326. (1895?)

Perithecia thickly gregarious and occasionally crowded, subglobose to ovoid, black, clothed externally with stout rigid yellowish hairs; hairs acute or subacute, 12–14 μ in diameter near the

base with a narrow cavity extending longitudinally through the center, pale yellow with the microscope; asci clavate, 8-spored, about 100 × 15–18 μ; spores 2-seriate or irregularly crowded, cylindric or cymbiform with acute ends, hyaline or pale yellowish, 25–30 × 5–6 μ, granular within and often pseudoseptate near the center (*pl. 1, f. 4–7*).

On rotten wood.

TYPE LOCALITY: Europe.

DISTRIBUTION: New Jersey to Ontario and Ohio.

ILLUSTRATIONS: Albert. & Schw. Consp. *pl. 5, f. 7;* Berl. Ic. Fung. **1**: *pl. 107, f. 2.*

3. LASIOSPHERIA STUPPEA Ellis. & Ev. Bull. Washburn Lab. Nat. Hist. **1**: 4. 1884

Perithecia superficial, gregarious, ovoid, about 1 mm. in diameter, densely clothed with light brown hairs; hairs simple, flexuous, blunt, with small central cavity, pale yellowish with transmitted light, 200–400 μ long and about 6 μ in diameter; ostiolum strongly 4-ribbed giving the appearance of a cluster of four perithecia imbedded in a stroma; asci clavate, 8-spored, 18–20 μ in diameter and about 200 μ long; spores partially 2-seriate, elongate-ellipsoid, 30–38 × 8–10 μ, hyaline or slightly yellowish at maturity, with 1–3 oil-drops (*pl. 1, f. 8–11*).

On dead wood of *Tsuga Pattoniana.*

TYPE LOCALITY: Mt. Paddo, Washington.

DISTRIBUTION: Known only from the type locality.

ILLUSTRATION: Ellis & Ev. N. Am. Pyrenom. *pl. 19, f. 5–10.*

4. LASIOSPHAERIA HISPIDA (Tode) Fuckel, Symb. Myc. 147. 1869

*Sphaeria hispida* Tode, Fungi Meckl. **2**: 17. 1791.

*Sphaeria Rhacodium* Pers. Syn. Fung. 74. 1801.

*Sphaeria hirsuta* Pers. Ann. Bot. Usteri **11**: 24. 1794.

*Sphaeria emergens* Schw. Trans. Am. Phil. Soc. II. **4**: 212. 1832.

*Lasiosphaeria hirsuta* Ces. & De-Not. Comm. Soc. Critt. Ital. **1**: 229. 1863.

*Lasiosphaeria Rhacodium* Ces. & De-Not. Comm. Soc. Critt. Ital. **1**: 229. 1863.

?*Sphaeria orthotricha* Berk. & Curt. Grevillea **4**: 108. 1876.

Perithecia gregarious, seated on a more or less well developed subiculum consisting of a black mycelial growth, ovate to pyriform, black, roughened and abundantly clothed with hairs; hairs black to the unaided eye, very dark brown with the microscope, long and flexuose near the base and shorter and more or less rigid above, blunt or subacute, simple or sparingly septate, the shorter hairs about 50–80 $\mu$ in length and 6 $\mu$ in diameter, quite variable in length; substance of the perithecium tough, black and opaque; asci cylindric or clavate, 8-spored; spores 2-seriate or irregularly crowded, long vermiform, often abruptly curved near one end, hyaline, becoming pale brown with 8–10 large distinct oil-drops, for a long time simple, finally becoming delicately 6–7-septate, usually with one septum between each two oil-drops, 50–80 × 6–8 $\mu$ (*pl. 2, f. 1–7*).

On rotten wood.

TYPE LOCALITY: Mecklenburg, Germany.

DISTRIBUTION: New York to Montana, Colorado and Alabama.

ILLUSTRATIONS: Tode, Fungi Meckl. **2**: *pl. 10, f. 84*; Rabenh. Krypt. Fl. **1**[1]: 194, *f. 1–3*.

EXSICCATI: Ellis, N. Am. Fungi *893;* Ellis & Ev. Fungi Columb. *116, 3314;* Shear, N. Y. Fungi *359*.

5. LASIOSPHAERIA TERRESTRIS (Sow.) de Thüm. Myc. Univ. 1744. 1881

*Sphaeria terrestris* Sow. Brit. Fungi *pl. 373, f. 7*.

Perithecia scattered or gregarious, black or brownish black, nearly globose, about .5 mm. in diameter, clothed externally with a rather dense covering of rigid black hairs; hairs 7–8 $\mu$ in diameter at the base, rather blunt and about 200 $\mu$ long; asci clavate, 8-spored; spores vermiform, crowded in the ascus, 65–70 × 6 $\mu$, hyaline, multiguttulate, often with the end enlarged, becoming pale brownish at maturity and with several delicate septa (*pl. 2, f. 10–12*).

On soil.

TYPE LOCALITY: Great Britain.

DISTRIBUTION: Ohio; also in Europe.

ILLUSTRATION: Sow. Brit. Fungi *pl. 373, f. 7*.

6. **Lasiosphaeria multiseptata** Earle sp. nov.

Perithecia as in *Lasiosphaeria hispida;* spores long vermiform, slender, at first with numerous oil-drops, later becoming (many-

septate?), occasionally with one end of the spore enlarged forming a conspicuous head, 60–70 × 3–4 μ (*pl. 2, f. 8–9*).

Type collected on rotten wood of *Hicoria* at Tuskegee, Alabama, July 29, 1897, G. W. Carver *313* (herb. N. Y. Bot. Garden).

DISTRIBUTION: Alabama and Carolina.

EXSICCATI: Rav. Fungi Car. Exsicc. **5**: *66* (as *Sphaeria Rhacodium*).

The material from which the above species is described was labeled "sp. nov." in the herbarium of the New York Botanical Garden, and while closely related to *Lasiosphaeria hispida* seems to differ in the more slender spores which are multiguttulate and finally (many-septate ?) with the upper end occasionally enlarged into a conspicuous head.

In looking over the specimens under the name of *Lasiosphaeria hispida* several were found which agree with the one described here. Whether the enlargement of the end of the spore is a variable character as has already been noted in *Lasiosphaeria mucida*, I am unable to determine, but it is possible that this may be found to be the case.

### 7. **Lasiosphaeria globularis** (Batsch)

*Sphaeria globularis* Batsch, Elench. Fung. Cont. **1**: 271. 1786.

*Sphaeria spermoides* Hoffm. Veg. Crypt. **2**: 12. 1790.

*Lasiosphaeria spermoides* Ces. & De-Not. Comm. Soc. Crit. Ital. **1**: 229. 1863.

*Leptospora spermoides* Fuckel, Symb. Myc. 143. 1869.

? *Hypoxylon miliaceum* Bull. Herb. Fr. *pl. 444*.

Perithecia sessile, usually thickly crowded forming a compact mass somewhat resembling a *Hypoxylon*, often several cm. in diameter, at first cylindric, becoming subglobose, often so closely crowded as to become irregular in form from mutual pressure, black, 1 mm. high and .5 to 1 mm. in diameter, ostiolum only slightly prominent, slightly hairy becoming naked with age and minutely rough, very hard and carbonaceous; asci cylindric, 8-spored; spores cylindric, slightly curved, 20–27 × 4 μ, hyaline (*pl. 1, f. 16–18*).

On old wood.

TYPE LOCALITY: Germany.

DISTRIBUTION: Newfoundland to New York.

ILLUSTRATIONS: Batsch, Elench. Fung. l. c. *pl. 30, f. 180;* Rabenh. Krypt. Fl. $1^2$: 195, *f. 1–3;* Engler-Prantl, Nat. Pfl. $1^1$: 397, *f, 256,* A–B.

8. **Lasiosphaeria jamaicensis** sp. nov.

Perithecia thickly gregarious, depressed, subconic, flattened below so as to appear to be partially immersed in the substratum but in reality entirely superficial, when removed leaving a ring-like scar 1 mm. across, the diameter of the base of the perithecium, ostiolum large, circular and rather prominent, the entire perithecium covered with a brownish floccose coat or entirely black, sparingly clothed with delicate erect bristles which also occur on the substratum surrounding the perithecia; hairs very dark brown or blackish, septate, rather blunt, 10–12 $\mu$ in diameter at the base; asci clavate, 8-spored; spores vermiform with blunt ends, abruptly bent near the center, 8-guttulate, becoming 7-septate, subhyaline or slightly yellowish, 50–60 $\times$ 7 $\mu$; paraphyses numerous and filiform (*pl. 1, f. 1–3*).

Type collected on the stem of some unknown plant (probably a palm) at Castle Gardens, Jamaica, December 14–15, 1908, by W. A. and Edna L. Murrill, *127* (herb. N. Y. Bot. Garden).

DISTRIBUTION: West Indies.

9. LASIOSPHAERIA NEWFIELDIANA Ellis & Ev. N. Am. Pyrenom. 150. 1892

?*Lasiosphaeria ambigua* Sacc. Michelia 1: 46. 1879.

Perithecia gregarious, superficial, at first depressed, becoming ovoid or subconic, about .5 mm. broad and as large as 1 mm. in height, clothed with soft brown hairs and seated on a dense brown mycelial growth consisting of the same kind of hairs; hairs brown, septate, about 4 $\mu$ in diameter; asci cylindric, 8-spored; spores vermiform, at first hyaline, 35 $\times$ 4 $\mu$, with a short apiculus at each end, the upper end finally enlarged into an ellipsoid, brown head; at maturity the spore consisting of the brown head 15–17 $\times$ 6–7 $\mu$ with a cylindric hyaline appendage 3 $\times$ 20 $\mu$ at the base, and a slightly shorter, much more slender appendage, 1–2 $\mu$ in diameter at the apex (*pl. 1, f. 12–15*).

On rotten wood.

TYPE LOCALITY: Newfield, New Jersey.

DISTRIBUTION: New Jersey to Ohio.

10. LASIOSPHAERIA DICHROÖSPORA Ellis & Ev. Erythea 1: 197. 1893

Perithecia densely gregarious, ovoid, rugose, black, tough-membranaceous, clothed with a few slender brown hairs; ostiolum broad convex-papilliform, sometimes subcompressed; asci lanceolate, 150 × 8-10 μ, 8-spored; spores 2-seriate, cylindric, bent near the lower end and hyaline below for about one third the length of the spore, abruptly black above, each end mucronately pointed, about 40–60 × 4–6 μ (*pl. 2, f. 13–15*).

On clay loam in woods.

TYPE LOCALITY: Seattle, Washington.

DISTRIBUTION: Known only from the type locality.

EXCLUDED SPECIES

*Lasiosphaeria striata* Ellis & Ev. Proc. Acad. Nat. Sci. Phil. **1893**: 443. This species was described from material collected on willow limbs near Park Hill, Ontario, Canada, May 1893 by J. Dearness. The plant is a discomycete belonging to the genus *Godronia* and is apparently identical with *Godronia Betheli* Seaver which was described from material collected on branches of willow in the Rocky Mountains of Colorado. The small cups are constricted at their mouths and when dry collapse so as to give the appearance of perithecia which probably accounts for the fact that they were placed in the genus *Lasiosphaeria* by Ellis. The species would then be *Godronia striata* (Ellis & Ev.) Seaver with *Godronia Betheli* Seaver as a synonym.

EXPLANATION OF PLATE LXVI

Spores and asci drawn with camera lucida to a common scale.

Figs. 1–3. *Lasiosphaeria jamaicensis* Seaver. 1. Perithecia about natural size. 2. Perithecia enlarged. 3. Ascus and spores.

Figs. 4–7. *Lasiosphaeria strigosa* (Albert. & Schw.) Sacc. 4. Perithecia about natural size. 5. Perithecia enlarged. 6. Ascus with spores.

Figs. 8–11. *Lasiosphaeria stuppea* Ellis & Ev. 8. Perithecia about natural size. 9. Perithecia enlarged. 10. Ascus with spores. 11. Hair from perithecium.

Figs. 12–15. *Lasiosphaeria newfieldiana* Ellis & Ev. 12. Perithecia about natural size. 13. Perithecia enlarged. 14. Ascus with immature spores. 15. Ascus with mature spores.

Figs. 16–18. *Lasiosphaeria globularis* (Batsch) Seaver. 16. Perithecia about natural size. 17. Perithecia enlarged. 18. Ascus with spores.

EXPLANATION OF PLATE LXVII

Spores and asci drawn with camera lucida to a common scale.

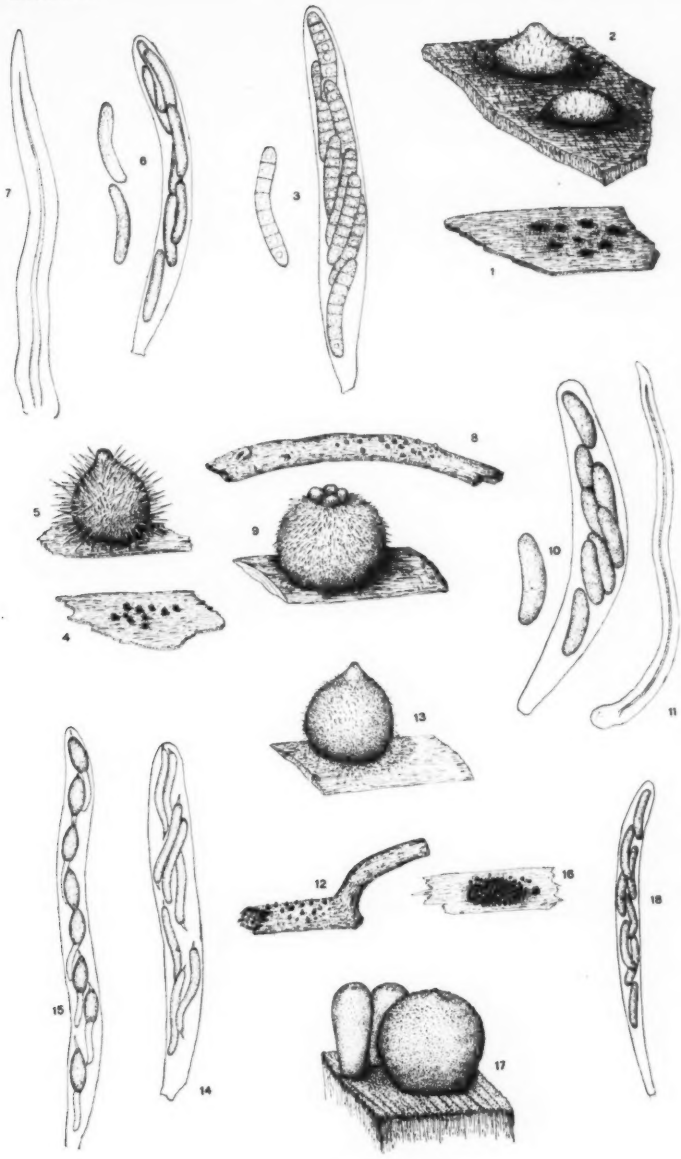
Figs. 1–7. *Lasiosphaeria hispida* (Tode) Fuckel. 1. Perithecia about natural size. 2. Hair from base of perithecium. 3 and 4. Perithecia enlarged. 5. Ascus with spores. 6. Spore showing septa. 7. Hairs from perithecia.

Figs. 8–9. *Lasiosphaeria multiseptata* Earle. 8. Ascus with spores. 9. Spores showing enlarged head.

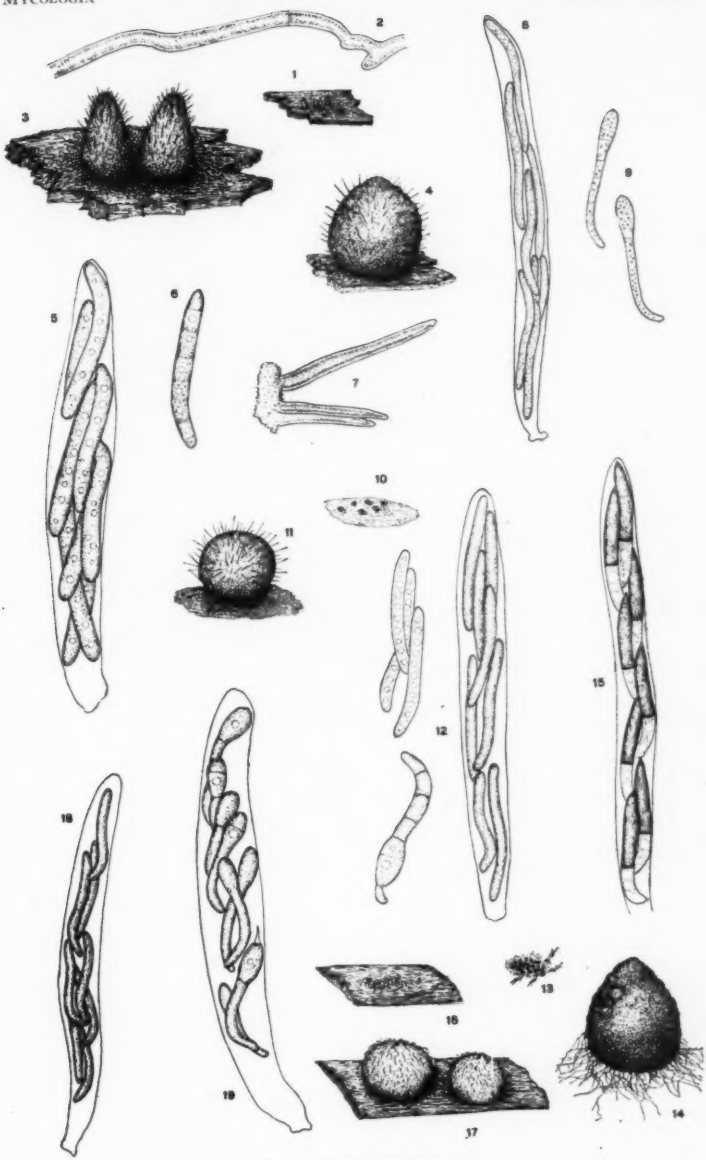
Figs. 10–12. *Lasiosphaeria terrestris* (Sow.) deThüm. 10. Perithecia about natural size. 11. Perithecia enlarged. 12. Ascus with spores.

Figs. 13–15. *Lasiosphaeria dichroöspora* Ellis & Ev. 13. Perithecia about natural size. 14. Perithecia enlarged. 15. Ascus with spores.

Figs. 16–19. *Lasiosphaeria mucida* (Tode) Seaver. 16. Perithecia about natural size. 17. Perithecia enlarged. 18. Ascus with immature spores. 19. Ascus with spores showing enlarged heads.




LASIOSPHAERIA




LASIOSPHAERIA

# AN ENUMERATION OF LICHENS COLLECTED BY CLARA EATON CUMMINGS IN JAMAICA—I

LINCOLN W. RIDDLE

The lichens forming the basis of the following enumeration were collected by the late Professor Clara Eaton Cummings, of Wellesley College, on a trip to the island of Jamaica in the West Indies during February and March, 1905. After Professor Cummings' death, the collection was sent according to her instructions to the New York Botanical Garden. It is through the courtesy of Dr. and Mrs. N. L. Britton that I have been permitted to study the material.

The present paper contains the lichens of the groups Coniocarpineae, Cyclocarpineae, and Hymenolichenes. The Graphidineae are now being studied by Professor Bruce Fink, and these together with the Pyrenocarpeae will be treated in a subsequent paper.

It is unfortunate that the exact data relating to the locality and habitat of the specimens collected were lost after Professor Cummings' death, and it is, therefore, possible to give only the numbers attached to the specimens. Material of several of the numbers has been issued during the last two years in Mr. G. K. Merrill's Lichenes Exsiccati. All such will be referred to in connection with the respective species.

The study of the lichen flora of tropical America is attended with considerable difficulty, owing chiefly to two facts: first, in the case of many of the species there are no authentic specimens in American herbaria; and, second, the literature, while considerable in amount, is widely scattered and for the most part not correlated. In addition to Tuckerman's Synopsis of the North American Lichens, the most useful single work is Wainio's Étude sur les lichens du Bresil (in Acta Soc. Fauna et Flora Fennica. 1890). This is cited in the following enumeration as Wainio

1890. All other citations are given with sufficient completeness to be self-explanatory.

I am indebted to the courtesy of Professor W. G. Farlow for permission to consult the collections in the Cryptogamic Herbarium of Harvard University. Three collections therein contained have been of special help: Wright's Lichenes Cubae, determined by Tuckerman; Lindig's New Granada (Colombia) collections, determined by Nylander; and Wainio's Lichenes Brasiliensis Exsiccati.

I have followed the classification and nomenclature of Dr. Zahlbruckner's treatment of the lichens in Engler and Prantl's Die Naturlichen Pflanzenfamilien, Teil 1, Abteilung 1*; except that I have maintained *Biatora* as a genus distinct from *Lecidea*, and *Bilimbia* as distinct from *Bacidia*, and I have retained *Anaptychia* as a section of the genus *Physcia*.

## CONIOCARPINEAE

SPHAEROPHORUS COMPRESSUS Ach. Meth. 135. 1803. Cummings no. 167.

## CYCLOCARPINEAE

1. PILOCARPON TRICHOLOMA (Mont.) Wainio (1890) **2**: 89. *Biatora* Mont. Ann. Sci. Nat. III. **16**: 53. 1851. *Lecidea leucoblephara* Nyl. Ann. Sci. Nat. IV. **19**: 337. 1863 is considered by Tuckerman to be the same, and the description offers no sufficient characters to distinguish the two. Cummings nos. 175 and 187.

2. OCELLULARIA ACTINOTUM (Tuck.) Muell. Arg. Flora **70**: 397. 1887. *Thelotrema* Tuck. Proc. Am. Acad. Arts and Sci. **5**: 411. 1862. Cummings no. 107.

3. ?**Ocellularia anamorphum** (Nyl.) comb. nov. *Thelotrema* Nyl. Ann. Sci. Nat. IV. **19**: 329. 1863. Cummings no. 131 appears to belong here, but there has been no material available for comparison, and the descriptions are incomplete.

4. OCELLULARIA AUBERIANOIDES (Nyl.) Muell. Arg. Nuov. Giorn. Bot. Ital. **23**: 395. 1891. Cummings nos. 98 and 102.

5. OCELLULARIA CLANDESTINA (Ach.) Muell. Arg. Graph. Féean. in Mem. Soc. phys. et d'hist. nat. de Genève, vol. 29, no. 8, p. 7. 1887. Cummings nos. 94 and 96.

6. OCELLULARIA TEREBRATA (Ach.) Muell. Arg. loc. cit. Cummings no. 104.

7. THELOTREMA CONCRETUM Fée, Essai Suppl. 90. 1837. Cummings no. 100.

8. DIPLOSCHISTES SCRUPOSUS (L.) Norm. Con. Praem. Gen. in Nyt Magazin for Naturvidensk. **7**: 232. 1853. *Urceolaria* Ach. Cummings no. 139.

9. MICROPHIALE LUTEA (Dicks.) Steiner, Sitzungsber. kais. Akad. Wiss. Wien **106**: 227. 1897. *Gyalecta* Tuck. Cummings no. 139.

10. GYALECTA GLOEOCAPSA (Nitschke) Zahlbr. in Engler & Prantl: Nat. Pflanzenfam. Teil 1, Abt. 1*, p. 126. 1905. *Bryophagus Gloeocapsa* Nitschke in Rabenhorst's Lich. Europ. no. 608. 1861. Cummings no. 85. This agrees exactly with some of the original material, and is of interest in being, so far as I am aware, the only record of the species outside of central Europe.

11. COENOGONIUM LEPRIEURII (Mont.) Nyl. Ann. Sci. Nat. IV. **16**: 89. 1861. Cummings no. 170.

12. **Biatora aurigera** (Fée) comb. nov. *Lecidea* Fée Essai Crypt. 106. 1824. Cummings no. 132. The specimens agree with the descriptions, but there has been no material available for comparison.

13. BIATORA COARCTATA (Smith) Tuck. Syn. N. A. L. **2**: 15. 1888. Cummings no. 115.

14. **Biatora amorphocarpa** sp. nov.

Thallus white, farinose, made up of more or less heaped and conglomerate granules, effused and indeterminate. Apothecia 0.3–0.7 mm. in diameter, at first plane, disk dark ferruginous-brown, with a thick paler brown margin, then becoming tuberculose-proliferate and difform, and somewhat paler. Exciple ferruginous, epithecium olivaceous, granulate, thick (10 $\mu$); paraphyses sparingly branched above, with clavate tips; hymenium pale, 50 $\mu$

high, becoming blue with iodine; hypothecium pale, KOH. Spores 8, fusiform, with rounded ends, more or less guttulate (rarely faintly uniseptate), hyaline, 13–15 × 3 μ.

Type collected on bark, Jamaica, B. W. I. Clara E. Cummings nos. 135 and 140, in the herbarium of Wellesley College.

15. **Biatora endocaerulea** sp. nov.

Thallus scanty, of scattered and irregularly heaped, discrete, minute, crystalloid granules. Apothecia minute, under 0.5 mm. in diameter, elevated, always emarginate, at first regularly subglobular, then proliferous and forming irregular gibbous masses, reaching about 1 mm. in diameter. In section the entire apothecium, including hymenium and hypothecium is a beautiful deep indigo blue, turning clear green with KOH. Spores 8, hyaline, simple, or rarely faintly uniseptate, narrow-oblong, 8–10 × 3.5 μ.

Type collected on bark, Jamaica, B. W. I. Clara E. Cummings no. 161, in the herbarium of Wellesley College.

16. **Biatora lanuginosa** sp. nov.

Thallus white, byssine, thick and felt-like, made up of loose, irregularly branching hyphae, 4–7 μ in diameter, with minutely roughened walls, surrounding green, Pleurococcus-like gonidia. Apothecia 0.5–1.5 mm. in diameter, disk dark brown, at first concave with a thick, minutely pubescent, pale margin, which shows a pinkish tinge, then becoming plane and strongly flexuous, and the margin thin. Epithecium and hymenium hyaline; exciple of radiating hyphae pale ferruginous; body of apothecium pseudoparenchymatous, darker ferruginous; hypothecium deep ferruginous-brown to brownish-black. Spores 8, hyaline, simple, oblong, 8–12 × 3.5–4 μ. Hymenium greenish-blue with iodine.

Type collected on the ground over matted roots, Jamaica, B. W. I. Clara E. Cummings no. 121, in the herbarium of Wellesley College.

17. BIATORA ONCODES Tuck. Syn. N. A. L. **2**: 157. 1888. *Lecidea* Tuck. Proc. Am. Acad. Arts and Sci. **6**: 274. 1864. Cummings no. 119.

18. **Catillaria leptocheila** (Tuck.) comb. nov. *Lecidea* Tuck. in Proc. Am. Acad. Arts and Sci. **6**: 280. 1864. *Heterothecium* Tuck. Syn. N. A. L. **2**: 55. 1888. Cummings no. 149.

19. **Catillaria rosea** sp. nov.

Thallus thin to medium, creamy-fuscescent, verruculose-

uneven. Apothecia 0.8–1.5 mm. in diameter, scattered, somewhat elevated, convex to globular, in part irregular to subdifform, always emarginate. In section the entire apothecium below the hymenium is brownish-black, becoming a beautiful rose-red with KOH; epithecium fuliginous; hymenium pale, becoming greenish-blue with iodine. Spores 8, hyaline, narrow-ellipsoid, somewhat larger at one end, bilocular, 10–13 × 4–5 μ.

Type collected on bark, Jamaica, B. W. I. Clara E. Cummings no. 127, in the herbarium of Wellesley College.

20. **Megalospora Cummingsiae** sp. nov.

Thallus sulphur-color, thick and irregular, coarsely verrucose-granulose to finely mealy. Apothecia ample, 2–3 mm. in diameter, dark rufous-brown, with a thick, entire, concolorous and persistent margin. Epithecium and exciple deep brown; hymenium white, opaque, 250 μ high, without reaction with iodine; hypothecium thin, white, subtended by a brownish-black layer. Spores solitary or 2, thick-walled, curved, 72–110 × 20–26 μ. Distinct from *M. sulphurata* Mey. & Flot. in the partly mealy thallus, the large spores, and the absence of reaction of the hymenium with iodine.

Type collected on bark, Jamaica, B. W. I. Clara E. Cummings no. 129, in the herbarium of Wellesley College. I take pleasure in naming this new species after its discoverer, in recognition of her services to North American lichenology.

21. **Megalospora jamaicensis** sp. nov.

Thallus stramineous, thin, continuous, smooth and shining. Apothecia 1–1.5 mm. in diameter, elevated, disk pale brown, with a thick, stramineous margin, which is entire when young, becoming crenate with age. Exciple pale yellow, epithecium and hypothecium hyaline. Spores solitary (or 2), hyaline, bilocular, thick-walled, straight or slightly curved, 72 × 20 μ. Distinct from *M. sulphurata* Mey. & Flot. in the color of the apothecia and the straighter spores.

Type collected on bark, Jamaica, B. W. I. Clara E. Cummings nos. 138 and 142, in the herbarium of Wellesley College.

22. MEGALOSPORA VERSICOLOR (Fée) Zahlbr. in Engler & Prantl Nat. Pflanzenfam. Teil 1, Abt. 1*, p. 134. 1905. *Lecidea* Fée. *Heterothecium* Flot. Cummings nos. 151 and 153.

23. **Bilimbia artytoides** (Nyl.) comb. nov. *Lecidea* Nyl. Ann. Sci. Nat. IV. **19**: 342. 1863. *Biatora triseptata* var. *artytoides* Tuck. Genera Lich. 162 (note). 1872. Cummings no. 166.

24. BILIMBIA HYPNOPHILA (Ach.) Th. Fr. Lich. Arctoi 183. 1860. Cummings no. 166*a*.

25. **Bilimbia pallidissima** sp. nov.

Thallus dirty white, thin, of more or less discrete, flattened, minute granules. Apothecia minute, 0.2–0.5 mm. in diameter, closely appressed and flattened, emarginate from the beginning, soon irregular and confluent, very pallid. In section the apothecium is entirely hyaline in all parts. Spores 8, hyaline, 4-locular, fusiform, blunt, broader at one end, 17–20 × 4–5 μ.

Type collected on bark, Jamaica, B. W. I. Clara E. Cummings no. 134, in herbarium of Wellesley College. Stock of *B. sphaeroides* (Dicks.) Th. Fr., from which it differs in the thallus and in the shape of the apothecia.

26. **Bilimbia radicicola** sp. nov.

Thallus pale creamy-brown, thick, encrusting the substratum, finely but densely granular. Apothecia 0.6–1 mm. in diameter, dark ferruginous-brown, at first somewhat concave, with a thick, flexuous paler margin, then becoming plane to convex and the margin less prominent, although always persistent. Exciple and epithecium pale; hymenium tinged with brown; hypothecium brownish-black. Spores 8, hyaline, 4-locular, oblong-ovoid to broad fusiform, larger at one end, 22–30 × 8–10 μ.

Type found growing over matted roots, Jamaica, B. W. I. Clara E. Cummings no. 162, in the herbarium of Wellesley College. Apparently related to *B. molybditis* (Tuck.).

27. **Bilimbia thysanota** (Tuck.) comb. nov. *Lecidea* Tuck. Proc. Am. Acad. Arts and Sci. **6**: 277. 1864. *Biatora* Tuck. Syn. N. A. L. **2**: 158. 1888. Cummings no. 150.

28. **Bilimbia terrestris** sp. nov.

Thallus dirty white, of heaped and conglomerate granules, which average 0.2 mm. in diameter, the heaps scattered and not forming a continuous thallus. Apothecia 0.8–1 mm. in diameter, subimmersed, solitary or aggregated, convex to globular, emar-

ginate, ferruginous-brown to almost black. Epithecium pale greenish; hypothecium pale; paraphyses filiform, sparingly branched above, hymenium hyaline, becoming blue with iodine. Spores 8, hyaline, 4-locular, fusiform-oblong with rounded ends, 17–22 × 6–9 μ.

Type collected on earth, Jamaica, B. W. I. Clara E. Cummings no. 164, in herbarium of Wellesley College. In habit, this species resembles *B. artytoides* (Nyl.), but it is distinct in the discrete granules of the thallus, in the convex and emarginate apothecia, and in the pale hypothecium.

29. BACIDIA ENDOLEUCA (Nyl.) Kicks. Fl. Crypt. Fland. **1**: 261. 1867. *Biatora atrogrisea* (Delise) Hepp. Cummings no. 148.

30. BACIDIA RUBELLA (Hoffm.) Mass. Ric. sull. auton. Lich. 118. 1852. *Biatora* Rabenh. Cummings no. 124.

31. **Bacidia subgranulosa** (Tuck.) comb. nov. *Lecidea microphyllina* var. *subgranulosa* Tuck. Proc. Am. Acad. Arts and Sci. **6**: 278. 1864. *Biatora subgranulosa* Tuck. Syn. N. A. L. **2**: 40. 1888. Cummings no. 118.

32. **Toninia janeirense** (Muell. Arg.) comb. nov. *Thalloidima* Muell. Arg. Hedwigia **31**: 280. 1892. Cummings no. 48. The specimens agree exactly with the description, but there has been no material available for comparison.

33. BOMBYLIOSPORA TUBERCULOSA (Fée) Mass. Ricerch. sull. auton. Lich. 116. 1852. *Heterothecium* Flot. Cummings no. 145.

34. **Lopadium amaurum** (Wainio) comb. nov. *Lecidea* Wainio in Journ. of Bot. **34**: 103. 1896. Cummings no. 152.

35. LOPADIUM LEUCOXANTHUM (Spreng.) Zahlbr. Sitzungsber. kais. Akad. Wiss. Wien **111**: 398. 1902. *Heterothecium* Mass. Cummings no. 146.

36. PHYLLOPSORA FURFURACEA (Pers.) Zahlbr. in Engler & Prantl Nat. Pflanzenfam. Teil 1, Abt. 1*, p. 138. 1905. *Lecidea* Pers. and many authors. *Biatora* Tuck. Cummings nos. 49 and 137.

37. PHYLLOPSORA PARVIFOLIA (Pers.) Muell. Arg. Bull. Herb. Boiss. vol. 2, append. 1, p. 90. 1894. *Biatora* Tuck. Cummings no. 44.

38. BAEOMYCES ABSOLUTUS Tuck. Amer. Journ. Sci. **28**: 201. 1859. Cummings no. 176.

39. BAEOMYCES ERYTHRELLUS (Mont.) Nyl. Syn. **1**: 181. 1858. Cummings nos. 177 and 178. No. 114 is sterile and has the stipes fastigiately branched, but it clearly belongs here also.

(*Note.*—As the full bibliographical citations for the species of *Cladonia* are given in Wainio's well-known "Monographia Cladoniarum Universalis," it has seemed unnecessary to give them here.)

40. CLADONIA AGGREGATA (Sw.) Ach. No. 73.

41. CLADONIA ALPESTRIS (L.) Rabenh. No. 83.

42. CLADONIA ANGUSTATA Nyl. No. 70. Issued in Merrill's Lich. Exsic. no. 63, as *C. Floerkeana f. intermedia* Hepp, but a comparison of the material with an authentic specimen of *C. angustata* in the Tuckerman herbarium shows it to be that species.

43. CLADONIA CERATOPHYLLA (Sw.) Spreng. No. 69.

44. CLADONIA DACTYLOTA Tuck. No. 71.

45. CLADONIA DEGENERANS (Flke.) Spreng. No. 79. This is a reduced form, but agrees well with some of the smaller specimens in the Tuckerman herbarium.

46. CLADONIA DIDYMA var. MUSCIGENA (Eschw.) Wainio. No. 72.

47. CLADONIA FIMBRIATA var. SIMPLEX (Weis.) Flot. No. 75.

48. CLADONIA FIMBRIATA var. SUBULATA (L.) Wainio. No. 74.

49. CLADONIA PITYREA (Flke.) Fr. Nos. 77 and 78. No. 76 also appears to belong here, although it is less typical.

50. CLADONIA RANGIFORMIS Hoffm. No. 81.

51. CLADONIA SYLVATICA (L.) Hoffm. No. 82.

52. STEREOCAULON CORNUTUM Muell. Arg. Flora **69**: 252. 1886. Cummings no. 11. Issued in Merrill's Lich. Exsic. no. 121 as *S. pityrizans* Nyl. Whether or not these two names are synonyms is a point that can be settled only by a study of the type specimens.

53. STEREOCAULON RAMULOSUM (Sw.) Ach. Meth. 314. 1803. Cummings nos. 9, 10, and 12 may all be placed here provisionally, awaiting the completion of a monographic revision of the genus now in progress.

54. DICHODIUM BYRSINUM (Ach.) Nyl. Lich. Nov. Zeland. 9. 1888. *Physma byrsaeum* (Afzel.) Tuck. Syn. N. A. L. **1**: 115. 1882. Cummings no. 45.

55. LEPTOGIUM BULLATUM (Ach.) Nyl. Syn. **1**: 129. 1858. Cummings no. 56.

56. LEPTOGIUM CHLOROMELUM (Sw.) Nyl. Syn. **1**: 128. 1858. Cummings no. 67. This is scarcely typical, but agrees with some of the material so named in the Tuckerman herbarium.

57. LEPTOGIUM MARGINELLUM (Sw.) Mont. apud Ramon de la Sagra: Hist. physique Cuba **1**: 115. 1838–1842. Cummings no. 68. Issued in Merrill's Lich. Exsic. no. 86.

58. LEPTOGIUM LACERUM (Sw.) S. F. Gray, Nat. Arr. Brit. Pl. **1**: 401. 1821. Cummings no. 60. This is sterile but agrees with material in the Tuckerman herbarium.

59. LEPTOGIUM PHYLLOCARPUM (Pers.) Nyl. Syn. **1**: 130. 1858. Cummings no. 59.

60. LEPTOGIUM PUNCTULATUM Nyl. Lich. Mexican. 1. 1872. Cummings no. 64. This has been compared with the material so named in Wainio's Lich. Brasil. Exsic. no. 380, from which it differs only in the thallus being more lacerate. But the spores are considerably larger than the measurements given by Wainio, being $33 \times 10\,\mu$ instead of a maximum of $28 \times 5\,\mu$, and the material may prove to be distinct.

61. LEPTOGIUM SATURNINUM (Dicks.) Nyl. Actes Soc. Linn. Bordeaux **21**: 272. 1856. *Leptogium myochroum* var. *tomentosum* (Hoffm.) Schaer. Cummings nos. 57 and 58.

62. LEPTOGIUM TREMELLOIDES (L. f.) S. F. Gray, Nat. Arr. Brit. Pl. **1**: 400. 1821. Cummings nos. 63 and 66; also 65 (?).

63. LEPTOGIUM TREMELLOIDES f. IMPRESSO-PUNCTATUM Tuck. in Wright's Lich. Cubae no. 17. Cummings no. 61. Issued in Merrill's Lich. Exsic. no. 131 as *L. foveolatum* Nyl. a species much more definitely lacunose than the present form, which is minutely and sparsely pitted.

64. PARMELIELLA TRYPTOPHYLLA (Ach.) Muell. Arg. Mem. Soc. phys. et d'hist. nat. de Genève **16**: 376. 1862. *Pannaria* Mass. Cummings no. 50.

65. PANNARIA LEUCOSTICTA Tuck. Proc. Am. Acad. Arts and Sci. **4**: 404. 1860. Cummings no. 47*a*.

66. PANNARIA RUBIGINOSA (Thunb.) Delise. Dict. Class. **13**: 20. 1828. Cummings no. 46. No. 47 also appears to belong here but is less typical.

67. **Erioderma microcarpa** sp. nov.

Thallus irregularly and more or less imbricately laciniate-lobate; upper surface fuliginous-brown, coarsely short-pilose, minutely but conspicuously roughened between the fibrils; under side sulphury to intensely yellow, conspicuously veined, and with white rhizoids. Upper cortex well-developed and pseudoparenchymatous. Apothecia very small for the genus, 0.8 mm. or less in diameter, pallid reddish-brown, borne on the surface of the thallus and somewhat elevated, margin concolorous, thick and subpersistent, glabrous. Exciple well-developed, of vertical, parallel, thick-walled hyphae, pallid, without gonidia, epithecium obscure, granular; hymenium hyaline, with iodine blue, slowly turning brown; hypothecium pallid. Spores 8, simple, hyaline, ovoid, the epispore thickened and minutely roughened, 12–16 × 7–8 μ.

Type collected in Jamaica, B. W. I. Clara E. Cummings no. 189, in herbarium of Wellesley College.

68. ERIODERMA WRIGHTII Tuck. Am. Journ. Sci. **25**: 423. 1858. Cummings no. 25.

69. ERIODERMA sp. Cummings no. 42 evidently belongs to this genus and to a different species from either of those given above, but it is sterile and too immature for certain determination.

70. COCCOCARPIA PELLITA (Ach.) Muell. Arg. Flora **65**: 320. 1882. *Pannaria molybdea* (Pers.) Tuck. Gen. Lich. 52. 1872. Cummings no. 143; also no. 160, which approaches var. *cronia* (Tuck.) Muell. Issued in Merrill's Lich. Exsic. no. 114.

(*Note.*—The tropical species of *Lobaria* and *Sticta* are much in need of monographic revision. In the absence of such a treatment I can do no more than give the results of a careful comparison of the specimens with the material in the Tuckerman herbarium.)

71. LOBARIA CORROSA (Ach.) Wainio (1890) **1**: 200. *Sticta dissecta* var. *corrosa* (Ach.) Tuck. Syn. N. A. L. **1**: 93. 1882. Cummings no. 21. Issued in Merrill's Lich. Exsic. no. 42.

72. **Lobaria pallida** (Hook.) comb. nov. *Sticta* Hook. in Kunth: Syn. plant. quas in itin. ad plag. aequinoct. orb. novi colleg. Humboldt & Bonpland **1**: 29. 1822. Cummings no. 23.

73. LOBARIA PELTIGERA (Delise) Wainio (1890) **1**: 199. *Sticta dissecta* Ach. and many authors. The material bearing this name in the Tuckerman herbarium varies very greatly, and it seems scarcely possible that it can all be one species.

(*a*) Cummings no. 24 is the smooth, polished form with very regular and beautiful sinuate lobing. It agrees best with the specimen in Wainio's Lich. Brasil. Exsic. no. 378. It also agrees with the type specimens of *Sticta Fendleri* Mont. & Tuck., which Tuckerman seems to have considered to be a synonym.

(*b*) Cummings no. 20 is an even, dull form with short rather irregular lobes. It agrees with material from Jamaica collected by J. Hart.

(*c*) Cummings no. 18 is the minutely pitted form with

narrower, somewhat irregular lobes, which agrees with many of the specimens in the Tuckerman herbarium. From the descriptions, one would consider this to be the *Ricasolia subdissecta* of Nylander (Ann. Sci. Nat. IV. **11**: 214. 1859), but material under the latter name in the Tuckerman herbarium does not agree. It is to be noted, also, that Delise in the original description of *Sticta peltigera* (Histoire du genre Sticta, 150. 1822) says "supra lacunoso." Material corresponding to no. 18 was issued in Merrill's Lich. Exsic. no. 41.

74. LOBARIA EROSA (Eschw.) Forssell, Bihang till k. Svenska Vet. Akad. Handlingar **8**: 24. 1883. *Sticta erosa* Tuck. Syn. N. A. L. **1**: 93. 1882. *Lobaria quercizans* Wainio (1890) **1**: 195, not Michx. Fl. Bor. Am. **2**: 324. 1803. Concerning the correct name to be used for this species, compare Hue in Nouv. Arch. Mus. d'Hist. Nat. Paris, IV. **3**: 34. 1901. Cummings nos. 19 and 22.

75. STICTA AURATA (Sm.) Ach. Meth. 277. 1803. Cummings nos. 26 and 27. Issued in Merrill's Lich. Exsic. no. 44.

76. STICTA CROCATA (L.) Ach. Meth. 277. 1803. Cummings no. 26*a* is paler than usual and approaches *S. Mougeotiana* Delise, an authentic specimen of which is in the Tuckerman herbarium.

77. STICTA CROCATA var. LEUCOSTICTA (Pers.) Nyl. Ann. Sci. Nat. IV. **11**: 238. 1859. Cummings no. 31.

78. STICTA DAMAECORNIS (Sw.) Ach. Meth. 276. 1803.

(*a*) No. 37 is the typical form.

(*b*) No. 30 is a more narrowed, and distinctly dichotomous form, agreeing well with *f. elongato-laciniata* Tuck. in Wright Lich. Cubae no. 60.

(*c*) No. 28 differs from no. 30 only in being narrower still (2 mm. wide or less) and the margins incurved so as to make the lobes subtubular.

79. STICTA DAMAECORNIS var. SINUOSA (Pers.) Nyl. Syn. **1**: 356. 1858. Cummings no. 36.

80. STICTA TOMENTOSA (Sw.) Ach. Meth. 279. 1803. Cummings no. 29 has cilia longer than usual and margins with occasional lobules, which are, however, not at all isidioid, as in *S. Weigelii* (Ach.) Wainio. No. 33 also comes here but has glabrous margins.

81. STICTA WEIGELII (Ach.) Wainio (1890) **1**: 189. *Sticta quercizans* Delise Hist. Sticta 84. 1822, and many authors. Cummings nos. 32, 34 and 35.

82. PELTIGERA CANINA (L.) Hoffm. Deutsch. Fl. **2**: 106. 1795. Cummings no. 51 is the typical form. No. 52 has been issued in Merrill's Lich. Exsic. no. 49 as "var. laciniata Merrill var. nov." This appears to be worthy of varietal rank and as the above is a *nomen nudum* a brief diagnosis is here appended: Thallus deeply cleft into relatively few, narrow lobes (1 cm. wide or less), with the margins more or less crenate and crisped; upper surface conspicuously tomentose; under side pale at the margin, becoming dark toward the center, with a few scattered, coarse rhizoids.

83. PELTIGERA POLYDACTYLA (Neck.) Hoffm. loc. cit. Cummings nos 53 and 54.

84. PERTUSARIA CRYPTOCARPA Nyl. Ann. Sci. Nat. IV. **11**: 221. 1859. Cummings no. 106 agrees with Nylander's description, except that the spores are somewhat larger (96–125 × 30–36 $\mu$ instead of 80–95 × 28–30 $\mu$).

85. PERTUSARIA LEIOPLACELLA Nyl. Bull. Soc. Linn. Normandie II. **2**: 71. 1868. Cummings no. 123.

86. PERTUSARIA TUBERCULIFERA Nyl. Ann. Sci. Nat. IV. **19**: 323. 1863. Cummings no. 103.

87. PERTUSARIA VELATA (Turn.) Nyl. Not. Sallsk. Faun. Flor. Fenn. **5**: 179. 1861. Cummings no. 101.

88. LECANORA PALLIDA (Schreb.) Schaer. Enum. Lich. Eu. 78. 1850. Cummings no. 120.

89. LECANORA SUBFUSCA (L.) Ach. Lich. Univ. 393. 1810. Cummings no. 113*a*.

90. LECANORA VARIA (Hoffm.) Ach. Lich. Univ. 377. 1810. Cummings nos. 113 and 130.

91. HAEMATOMMA PUNICEUM (Ach.) Wainio (1890) **1**: 72. *Lecanora* Ach. Syn. 174. 1814. Cummings no. 141.

92. PARMELIA CETRATA var. CILIOSA Viaud-Grand-Marais, Notes Parm. Phys. de l'Ouest 156. 1892. Cummings no. 38. Margins both sorediate and ciliate.

93. PARMELIA CETRATA var. SUBSIDIOSA Muell. Arg. Engler Jahrb. **20**: 256. 1894. Cummings no. 39. Margins isidiose and ciliate.

94. PARMELIA LAEVIGATA (Sm.) Ach. Syn. 212. 1814. Cummings nos. 17, 40 and 41.

95. PARMELIA PERFORATA (Wulf.) Ach. Meth. 217. 1803. Cummings no. 43 appears to belong here, but is scarcely typical, the rhizoids being almost wholly absent, and the margins with soredia as well as cilia.

96. PHYSCIDIA WRIGHTII Tuck. Proc. Am. Acad. Arts and Sci. **5**: 401. 1862. Cummings no. 125. This has been compared with the type specimens in Wright's Lich. Cubae no. 92 and agrees exactly. It is to be noted that Dr. Zahlbruckner in Engler & Prantl: Nat. Pflanzenfam. (loc. cit.) erroneously states that the spores of this genus are simple.

97. RAMALINA DENTICULATA (Eschw.) Nyl. Bull. Soc. Linn. Normandie II. **4**: 126. 1870. Cummings no. 179.

98. RAMALINA LINEARIS (Sw.) Ach. Lich. Univ. 598. 1810. Cummings nos. 180 and 181.

99. RAMALINA USNEOIDES (Ach.) Fr. Lich. Eu. 468. 1831. Cummings no. 188.

100. USNEA ANGULATA Ach. Syn. 307. 1814. Cummings no. 4 is a peculiar sorediate form; no. 5 is typical.

101. USNEA CERATINA Ach. Lich. Univ. 619. 1810. Cummings nos. 2 and 6.

102. USNEA DASYPOGA (Ach.) Nyl. apud Hue in Nouv. Arch. Mus. d'Hist. Nat. Paris III. **2**: 270. 1890. Cummings nos. 7 and 8.

103. USNEA FLORIDA (L.) Web. in Wigg. Prim. Fl. Holsat. 91. 1780. Cummings no. 3.

104. USNEA LAEVIS (Eschw.) Nyl. Syn. **1**: 271. 1858. Cummings no. 1. A part of the material is minutely white spotted, but it is not at all papillate. (*Usnea plicata* Ach. was issued in Merrill's Lich. Exsic. no. 109, but the species was not represented in the two sets which formed the basis of this enumeration.)

105. TELOSCHISTES FLAVICANS (Sw.) Norm. Con. Praem. Gen. in Nyt Magazin for Naturvidensk. **7**: 229. 1853. Cummings nos. 167 and 169. Issued in Merrill's Lich. Exsic. no. 59.

106. **Buellia stipitata** sp. nov.

Thallus entirely endophloeodal. Apothecia elevated and substipitate, 0.8–1.6 mm. in diameter, brownish-black, at first concave, with a prominent, thick, concolorous margin, then becoming plane, the margin less prominent but persistent, and the apothecia more or less flexuous. Epithecium fuliginous; hymenium hyaline, with iodine, blue, quickly becoming vinous-red; hypothecium brownish-black, subtended by a thick, fuliginous, pseudoparenchymatous region. Spores 8, brown, broad fusiform, bilocular, rarely each cell biguttulate, 14–17 × 5–7 μ.

Type collected on bark, Jamaica, B. W. I. Clara E. Cummings no. 122, in herbarium of Wellesley College.

107. BUELLIA SUBDISCIFORMIS (Leight.) Wainio (1890) **1**: 167. Cummings no. 147.

108. RINODINA CONRADI Koerb. Syst. Lich. Germ. 123. 1855. Cummings nos. 116 and 165.

109. RINODINA EXIGUA (Ach.) Th. Fr. Lich. Scand. 201. 1871. *R. sophodes* var. *exigua* Tuck. Syn. N. A. L. **1**: 208. 1882. Cummings no. 126.

110. PYXINE PICTA (Sw.) Tuck. Syn. N. A. L. **1**: 79. 1882. Cummings no. 112.

111. PHYSCIA COMOSA (Eschw.) Nyl. Syn. **1**: 416. 1858. Cummings nos. 13 and 14.

112. PHYSCIA HYPOLEUCA (Ach.) Tuck. Syn. N. A. L. **1**: 68. 1882. Cummings no. 16. This is typical, except that the ends of some of the lobes are sorediate.

113. PHYSCIA LEUCOMELA (L.) Michx. Fl. Bor. Am. **2**: 326. 1803. Cummings no. 15. Issued in Merrill's Lich. Exsic. no. 22.

## HYMENOLICHENES

CORA PAVONIA (Web.) Fr. Syst. Orb. Veg. 300. 1825. Cummings no. 168.

WELLESLEY COLLEGE,
WELLESLEY, MASSACHUSETTS.

# NOTES ON SOME WESTERN UREDINEAE WHICH ATTACK FOREST TREES[1]

GEORGE GRANT HEDGCOCK

The following paper is summarized from field notes on a number of heteroecious rusts on forest trees in the western United States.

## 1. PERIDERMIUM FILAMENTOSUM Peck

This fungus is the cause of a very serious disease of the western yellow pine (*Pinus ponderosa* Laws.) in portions of Colorado, and probably in adjacent sections of New Mexico and Arizona. This fungus was first discovered by Pringle[2] in the Santa Rita Mountains in Arizona, July 13, 1881. Although very abundant in certain localities in Montezuma and San Juan National Forests in southern Colorado, it was first discovered in Montezuma National Forest by F. B. Notestein (F. P. 190) the latter part of June, 1910. This collection was the second recorded, a portion of which was sent to Dr. J. C. Arthur and identified by him. Mr. Notestein again collected it on June 26, 1911 (F. P. 1888). Since then the fungus was collected by the writer July 8, 1911, on Pikes Peak, Colorado, in Pike National Forest, in East San Juan National Forest, July 13, 1911, near Pagosa Springs, Colorado, and in the Montezuma National Forest July 19, 1911, near Nancos, Ariz., (F. P. 9085). Mr. Notestein reports it as occurring abundantly in various parts of Montezuma National Forest. A tree apparently diseased with the fungus was noted enroute near Telluride, Colorado, July 19, 1911.

This species of *Peridermium* attacks the twigs, limbs, and trunks of both young and old trees in the cambium, but producing little or no swelling of the parts affected. There is a tendency occasionally towards witches broom formation where side limbs

[1] Published by permission of the Secretary of Agriculture.

[2] Arthur, J. C., and Kern, F. D. North American species of *Peridermium*. Bull. Torrey Club 33: 418. 1906.

are attacked, such limbs usually being more pendant than normal ones, being slightly thickened and clustered, resembling slightly the limbs in the pendant witches brooms formed by the stimulation of the mistletoe, *Razoumofskya cryptopoda* (Eng.) Coville. The fungus apparently spreads through the cambium of twigs, often entering the new growth each year. The effect of the fungus on the growth of such twigs is in some instances to slightly increase the number of twigs produced, and to increase their diameter; but usually there is no swelling produced. In a number of older trees, 75 to 150 years old, the apparent effect of the fungus on the main limbs had been to cause cankered areas to form, and to kill the entire tops, producing spike-topped trees. Such trees finally die, probably from the effects of insects or fungi which follow the weakening effects of the *Peridermium*. A large number of trees have either been stunted or slowly killed by this fungus in the Montezuma National Forest. Judging from the age and condition of many of the affected trees, the fungus has been present in this region for many years.

On Pikes Peak, beneath the trees diseased with *Peridermium filamentosum* only one rust was found which could be associated with this fungus as a telial form. The leaves of *Castilleja integra* A. Gray were found diseased with the uredinia of *Cronartium coleopsorides* (Dietel & Holway) Arthur during the second week in July, 1911. In the forest near Mancos, Colo., a few sori with the telia of the same fungus was found on the same species of *Castilleja* near some western yellow pines diseased with *Peridermium filamentosum*.

*Peridermium filamentosum*[3] or a closely related species was also found by Dr. E. P. Meinecke and Mr. W. H. Long, in Lassen National Forest, September 16, 1911, on the limbs and twigs of *Pinus contorta* Loud. In the immediate vicinity, *Cronartium coleosporoides* was found on a species of *Castilleja*, furnishing additional proof of the possible relation of the latter species of fungus to *Peridermium*. Inoculations will be made to verify this assumption of relationship between *Peridermium filamentosum* and *Cronartium coleosporoides* the coming season.

[3] This specimen has since been identified by Mr. W. H. Long as *Peridermium stalactiforme* Arth. and Kern.

*Peridermium filamentosum* apparently has been held in limited areas for a long time by natural boundaries to certain forests, viz., the treeless region separating the mountain ranges in Colorado, New Mexico, and Arizona. The fungus should be made the subject of further investigation, and watched closely, since its effect on seedling trees is much like the dreaded *Cronartium ribicola* Fischer (*Peridermium strobi* Kleb.) in Europe. It certainly should not be allowed to invade any of the forest tree nurseries in the West, from which it might be disseminated over a much greater region than its present habitat, and as a result great damage be done to our magnificent western yellow pine and related species.

### 2. PERIDERMIUM HARKNESII Moore

This species of *Peridermium* is found attacking the following species of pines in our western forests: *Pinus contorta* Loud., *P. Jeffreyi* "Oreg. Com.," *P. ponderosa* Laws., *P. radiata* Don., and *P. sabiniana* Dougl. The range of the species is from Colorado northward to Montana, and westward to Washington, Oregon, and California. It is most common on the lodgepole pines in the forests of the Rocky Mountains.

*Peridermium harknesii* has an effect on pines almost identical with that of *Peridermium cerebrum* Peck on pines in eastern and central United States. Globose or oblong galls or burls, varying in diameter from a pea to more than a foot are formed, usually surrounding the twigs, limbs, and trunks at the point of attack. Rarely a witches broom formation of limbs or twigs just above the galls takes place. Young trees attacked are often killed by the interference of the galls with the growth beyond the point of attack. In such cases the galls apparently have a strangulating effect. The fungus persists in the cambium of the galls for many years, but as in case of *Peridermium cerebrum,* rarely fruits annually. Apparently the older the galls become, the less frequently the aecia are formed on the surface.

Repeated and careful inoculation with aeciospores of this *Peridermium* on the leaves of young oaks of a number of species failed to infect them, while at the same time, inoculations with *Peridermium cerebrum* Peck on the same species of oak trees

brought about an infection, resulting in the uredinia and telia of *Cronartium quercum* (Brond.) Arth.

In nature, there is constantly associated with *Peridermium harknesii* a species of *Coleosporium* on a number of species of *Aster*. This association was found so constantly this year, as to venture the prediction that the *Coleosporium* may be a telial form of this species of *Peridermium*. It is very evident that the telial form cannot be a *Cronartium* on oaks, since none are found in an immense region in the Northwest, where this fungus occurs on the pines. It occurs where there are no oaks within a thousand miles.

*Peridermium harknesii*, like *P. cerebrum*, kills many young pines, but is not to be considered as dangerous a species as *P. filamentosum* in its effects on older trees, because it does not have the ability like the latter to spread along the limbs from the point of infection, but remains confined to the galls it forms.

### 3. PERIDERMIUM MONTANUM Arth. & Kern

This species of *Peridermium* attacks the leaves of *Pinus contorta* Loud. in the Northwest, but is not so widely disseminated as *P. harknesii*. It exerts an injurious effect on the leaves at the time it forms its aecia, owing to the bursting of the epidermis of the leaves by the pustules of the fungus. The leaves lose water, and gradually die, in fact, live but a short time after the aecia mature. This causes a premature shedding of the leaves, so that where a lodgepole pine, if healthy, would bear 5 to 7 years' foliage, trees after being attacked by an epidemic of this *Peridermium* usually bear only 2 to 3 years' growth of needles, all of which except the youngest, are plainly diseased.

This fungus was found epidemic this year only in a small area in Gallatin National Forest, near Bozeman. A species of *Coleosporium* was found present in great abundance on the leaves of two species of *Aster* in immediate proximity to badly infected pines. The *Coleosporium* is very injurious to the leaves of the asters. From this it is possible that the telial form of *Peridermium montanum* may be a species of *Coleosporium* on *Aster*. A further study will be made of both species of rust.

4. PERIDERMIUM COLORADENSE (Dietel) Arth. & Kern

This species of *Peridermium* attacks the spruces, *Picea engelmanni* Eng., *Picea parryana* (André) Parry, and *Picea sitchensis* (Bong.) Trautre & Mayer. On the Engelmann spruce, it is found almost throughout the entire range of the species. It causes the formation of dense, deciduous, leafy, witches brooms, with greatly metamorphosed, stunted branches. The presence of the brooms usually bring about, in a few years, the death of the limbs upon which they are situated. If the limb is adjacent to the trunk, its death is often followed by the entrance of the heart-rotting fungus *Trametes pini* (Brot.) Fr.

In the region near Anaconda, Montana, where the forest trees have been killed by smelter fumes, it was noted that these witches brooms are more sensitive to the fumes than the healthy portions of the trees, and that they succumb first from their effects. The telial form of this species of *Peridermium* has not been found.

5. MELAMPSORELLA ELATINA (Alb. & Schw.) Arth.

The aecial form of this rust (*Peridermium elatinum* Kunze & Schmidt) attacks a number of species of *Abies*. It forms leafy witches brooms with adherent leaves and metamorphosed branches. These brooms have a stunting effect on the limbs upon which they occur. Where a number of brooms occur on the same tree, the whole tree is decidedly checked in its growth. The following species of *Abies* in the national forests of the west and northwest are attacked by this fungus: *A. balsamea* (Linn.) Mill., *A. concolor* (Gord.) Parry, *A. grandis* Lindl., *A. lasiocarpa* (Hook.) Nutt., *A. nobilis* Lindl., and *A. magnifica* Murr.

According to Arthur,[4] the uredinial and telial forms of this *Peridermium* occur on species of *Alsine* and *Cerastrum*. No effort has been made on the part of the writer to collect specimens of telia, as all collections were made too early in the season to find the telia. The aecia mature in the west from early July in New Mexico to the middle of August in northern Montana. The same variation in the maturing of aecia was noted in case of *Peridermium coloradense*.

[4] North American Flora 7: 111, Mar. 1907.

### 6. PERIDERMIUM PSEUDO-BALSAMEUM (D. & H.) Arth. & Kern

This or closely related species of *Peridermium* attacks the leaves of the following species of conifers: *Abies grandis, A. lasiocarpa,* and *A. nobilis.* The great resemblance of these forms of *Peridermium* to the aecial form of *Calyptospora columnaris* (Alb. & Schw.) Kühn. puts our determination slightly in doubt.

The aecia are usually found sparsely in rows on the leaves of the trees attacked, occurring usually only on scattering leaves, so that the effect on the vitality of the tree is of little consequence. No epidemics of this fungus have been noted, and it has been found only on younger trees as a rule. It is frequently found associated with a *Melampsora* on species of *Vaccinium,* and may be the aecial form of a species of *Melampsora* or *Calyptospora.* This, owing to the presence of other aecia in the vicinity where collections were made, should be taken only as a suggestion for future experiments. More careful studies will be made to determine the exact relationship of these rusts on the leaves of various species of *Abies* to *Melampsora* on species of *Vaccinium.*

### 7. PERIDERMIUM CONORUM-PICEA (Russ) Arth. & Kern

This species occurs in the west occasionally on the cones of *Picea engelmanni* Eng., causing them to be abortive. The only apparent harm done is in lessening the seed crop, but the fungus has never been found in sufficient abundance to be considered a serious hindrance to reforestation. The alternate form of the fungus has not been found.

### 8. CAEOMA CONIGENEUM Patouillard[5]

This species of *Caeoma* is one of the little-known forms. It attacks the cones of *Pinus chihuahuana* Eng., rendering them abortive. It occurs frequently on this host in southern Arizona, but aside from lessening the seed production, apparently does not injure the trees attacked. The telial form of this rust is unknown.

[5] Journal de Botanique **10**: 386. 1896.

9. UREDO (MELAMPSORA) BIGELOWII (Thüm.) Arth.

The aecial form of this rust on larches has not been collected as yet by the writer in the national forests, but it may be common, and if search were made at the right season, it might be found. The uredinial and telial forms are found on nearly every species of willow in the west and southwest, not only where larches are found, but where there are none within a thousand miles. It has been collected on the following species of *Salix: Salix amygdaloides* Anderss., *S. bebbiana* Sarg., *S. cordata lutea* (Nutt.) Bebb., *S. cordata mackenziana* Hook., *S. fluviatilis* Nutt., *S. laevigata* Bebb., *S. lasiandra* Benth., *S. lasiandra caudata* (Nutt.) Sudw., *S. lucida* Muehl., *S. nigra* Marsh., *S. nuttalii* Sarg., and *S. sessifolia* Nutt.

The telial form of the fungus fruits so abundantly on some species as to exert a decidedly stunting effect. On the willows cultivated by the Forest Service near Washington, D. C., for experiments in making baskets, it is a serious parasite.

10. UREDO (MELAMPSORA) MEDUSAE (Thüm.) Arth.

Species of poplar are commonly attacked by the uredinial and telial forms of this rust, but the aecial forms, supposedly on larches, have not been found. It has been collected on the following species of trees: *Populus acuminata* Rydb., *P. angustifolia* James, *P. balsamifera* L., *P. grandidentata* Michx., *P. tremuloides* Michx., and *P. trichocarpa* Torr. & Gr., chiefly in the west and northwest. It occurs so abundantly on some species as *P. acuminata* and *P. trichocarpa*, that it injures the leaves and arrests the growth of younger trees.

OFFICE OF INVESTIGATIONS IN FOREST PATHOLOGY,
BUREAU OF PLANT INDUSTRY,
WASHINGTON, D. C.

# NOTES UPON TREE DISEASES IN THE EASTERN STATES[1]

PERLEY SPAULDING

## THE CHESTNUT BLIGHT

Some attention has been given to the chestnut blight for the past three years. It was found in July, 1909, at Middlebury, Conn., for the first time, and in September, 1909, at Bantam, Conn. Also in September, 1910, at Amherst and Springfield, Mass., and in October, 1910, at Windsor, Conn. The writer has spent most of the month of October each year in the lower Connecticut valley and the adjoining territory; much time has been spent there during the past few years besides in October. The disease was found at Windsor, Conn., the second season it was there. At any rate, it was very scattering in the Connecticut valley in the fall of 1909. A trip was made in July, 1911, as far north as Hartford, Conn., and the disease was everywhere in evidence in the Connecticut valley. There can be no doubt that in the three years, 1909 to 1911 inclusive, the disease has spread so seriously as to now be beyond hopes of control in the lower Connecticut valley.

Considerable time this season was devoted to finding out the real situation of the chestnut blight in the state of Maryland. It was found to be much more serious than at first supposed. The northeastern corner of the state cut off by a line running from the northern edge of Baltimore, east to the Delaware line, and another a little westward and then northwestward to the Pennsylvania line is already too badly diseased for eradication to be successfully carried out. Outside this area the disease is very scattering and might with relatively small effort and expense be eradicated. The course of the disease in the Connecticut valley indicates that this must be done at once or not at all. There

[1] Paper presented before the American Phytopathological Society at the meeting of December, 1911.

can be no doubt that the disease is intimately connected with the distribution of chestnut nursery stock. Repeatedly, on finding badly diseased areas, the writer either found Japanese chestnut trees or was told that chestnut stock of some sort had been brought into that vicinity some years before. The disease has been at Parkton for at least six years and probably has been there one or two years longer. The peculiar appearance of chestnut trees affected by this disease is essentially due to the girdling action of the fungus. The following instance shows this very plainly: while scouting for the disease a tree was seen which had every appearance of having been killed down to the base by the blight. It had abundant suckers around the base, the dead leaves hung on the branches; in short, the tree had every symptom of the disease except the fruiting bodies of the fungus! Upon penetrating the thicket of suckers it was found that the tree had been girdled with an axe a few months before.

### LOPHODERMIUM NERVISEQUUM (D. C.) Fr.

A serious needle disease of balsam fir (*Abies balsamea* (Linn.) Mill.) has been under observation for the past five years in the Adirondack Mountains. This has been found to be caused by *Lophodermium nervisequum*. It attacks needles of all ages and occurs on trees of all sizes, but is more prevalent on the lower shaded branches or on young reproduction which is heavily overshadowed by larger trees. The disease is serious on small trees as it causes complete or nearly complete defoliation in many cases and kills the trees. The course of the disease on young leaves is fairly plain: infection begins about June first, soon after the new shoots and leaves are formed, and apparently may continue at almost any time after this date when weather conditions are favorable. The affected needles turn yellow soon, some appearing in July on the shoots of the same year. Toward fall they become more numerous and turn brown by the beginning of winter. The next April on the resumption of warm weather, a dark line shows along the middle of the leaf on the lower side; this becomes more and more prominent until about June first, when the warm rains bring about the rupture of the leaf epidermis. Along the entire length of the leaf there now appears

an open trough-like rupture with the epidermis rolled back on either side. It is probable that the period from infection to formation of mature fruiting bodies, in the majority of cases, is approximately one year, varying somewhat with weather conditions: there are apparently many cases in which this period is nearly two years and possibly even more. This disease is very prevalent in the Adirondack region and apparently occurs throughout the range of the balsam fir. It has not yet been found in nurseries, since its host is not much grown therein.

### PERIDERMIUM FRUCTIGENUM Arthur

Spores of *Peridermium fructigenum* from cones of *Tsuga canadensis* (L.) Carr., which had been collected in Connecticut two days before, were used to inoculate leaves of the following species of *Rhododendron* and *Kalmia*. *Rhododendron arborescens* (Pursh.) Torrey, *R. viscosum* (L.) Torrey, *R. nudiflorum* (L.) Torrey, *R. canescens* (Michx.) G. Don., *R. calendulaceum* (Michx.) Torrey, *R. canadense* (L.) B.S.P., *R. maximum* L., *R. catawbiense* Michx., *Kalmia latifolia* L., and *K. angustifolia* L. The inoculated plants were in a greenhouse at Washington and had their leaves further developed than would have been the case out of doors in Connecticut. This may have had an effect upon the results secured. In no case did infection occur, although the inoculations were made with and without wounds upon each species.

### LIGHTNING

While engaged in reconnaisance for the chestnut blight in Maryland, the past season, the writer time and time again examined chestnut trees which at a distance apparently were affected by blight, but which were killed, either completely or partially by lightning. Occasionally groups of trees standing close together were partially killed about some central tree which usually was entirely dead. More often only single trees were struck. The frequency of occurrence of such cases soon became very noticeable, especially the latter part of the summer. There must have been an average of three or four trees per square mile which were killed or badly crippled by lightning in a single season in the territory examined by the writer.

### MYXOSPORIUM ACERINUM Peck

Practically the entire season of 1911 the office of Investigations in Forest Pathology has received specimens of various species of maple which were apparently killed by *Myxosporium acerinum*. The writer found it in various parts of Vermont upon sugar maple. It is especially noticeable upon street and park trees. It starts upon small branches the size of one's finger but works back until larger ones are affected. Soon it gives the affected tree a ragged appearance and becomes noticed. All the cases seen seemed to have been entirely of the present season's standing. The only feasible method of combating this disease seems to be that of pruning out the affected parts and burning them.

### PHOMA PICIENA Peck

A new disease of Norway spruce (*Picea excelsa*) has for several years been attracting the attention of pathologists. The writer's attention was called to it by the superintendent of New York State Forests in 1909, but no specimens were seen. Selby has also mentioned a disease which is probably the same one. Peck in his last report named the fungus *Phoma piciena* which occurred on leaves of red spruce (*Picea rubra*) in the Adirondacks. This summer several specimens of diseased Norway spruce were sent into the office and secured by the writer from the vicinity of Baltimore and Washington. These bore abundant fruiting bodies of a fungus which came nearer to Peck's new species than to any other. Inoculations are being made in the greenhouse. The disease is quite destructive, often completely defoliating large trees and causing their death. Apparently the only practical treatment is that of burning the fallen needles and spraying with suitable fungicides to prevent further spread of the disease.

OFFICE OF FOREST PATHOLOGY,
BUREAU OF PLANT INDUSTRY,
U. S. DEPARTMENT OF AGRICULTURE.

# OROPOGON LOXENSIS AND ITS NORTH AMERICAN DISTRIBUTION

R. Heber Howe, Jr.

In a paper by the writer on the American Species of *Alectoria* (Mycologia **3**: 149, 1911), *Oropogon loxensis* (Fée) Th. Fries was excluded "on the ground of its distinctive spore differences," and it was stated that the plant would be treated later in a special paper. Material of this species is confined to the larger herbaria, and is not abundant even in such collections. During last winter I have had the opportunity of studying the material in the Museum d'histoire naturelle in Paris, through the kindness of Professor Mangin and Monsieur Hariot. This material was determined by Nylander.

The genus *Oropogon* was proposed for this species by Th. Fries in 1861. It was not recognized by Tuckerman (Gen. Lich. **14**: 1872) as he argued that a parallel dissimilarity of spore color

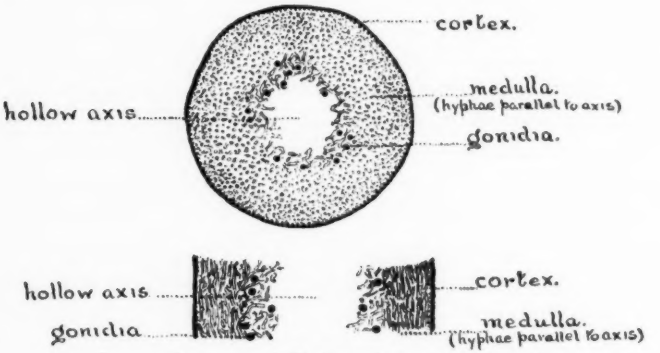



Fig. 1. Structure of Thallus of *Oropogon loxensis*.

and cell structure occurred unnoticed in other genera (*Acolium*, *Calcium*). Dr. Zahlbruckner (Nat. Pflanz. 220. 1907) recognizes, however, the genus not only on account of its muriform spores, but on account of its single-spored asci. Stizenberg

adopted the middle course and considered *Oropogon* as a subgenus. In my Classification de la Famille des Usneaceae l'Amerique du Nord, Paris, 1912, I followed the latter author, recognizing *Oropogon* as a section. After further study of spore characters and their phylogenetic importance (Hue, Bull. Soc. Bot. France **58**: 1911) I am inclined to give to the diverse types of spore septation generic rank, as I did in the first instance and in accord with Dr. Zahlbruckner's view.

OROPOGON LOXENSIS (Fée) Th. Fries

Type: not indicated; there is a specimen in the Museum at Paris which was collected by Bonpland and compared with the type by Nylander according to a note on the label, though the location of the type is not mentioned. Professor Dr. H. Kniep, of the Institut at Strassburg, kindly sent me the specimen here figured, which is taken for the type. The label, however, is the same as those in the Paris Museum collected by Lechler probably in 1854, and not in 1824. The specimen is decidedly atypical, and resembles more closely the boreal *Coelocaulon divergens* as stated below. Fée was a professor at Strassburg, but the type is probably in Brazil, where, however, I have been unable to locate it, although an attempt was made to do so through Dr. Neves Armond, of the Museo Nacional do Rio de Janeiro.

**Orginal description:** "(filamentis) tereti, laeviusculo, cinereofusco, ramosissimo, subintricato, prostato, ramulis capillaceis, tenuissimis, ultimis bifidis," . . . "(scutellis) terminalibus." Fée, Essai sur les Crypt. 137. 1824.

FIGURES: Fée, l. c. *pl. 31, f. 7,* supp. 134, 1837; et Nyl. Synop. Lich. *pl. 8, f. 16;* Zukal, Morph. und biol. Untersuch. Flecht., Sitz. Kais. Akad. Wissens. Wien. *pl. 2, f. 1.* 1895; March. Enum. Meth. Mycoph., Soc. d'et. Sci. **16**: *f. H.* 1896.

SYNONYMY: *Cornicularia loxensis* Fée, l. c.
*Alectoria loxensis* Nyl. Synop. Lich. 278. 1858–60.
*Atestia loxensis* Trevis, Flora 50. 1861.
*Oropogon loxensis* Th. Fries, Gen. Heter. 49. 1861.


FIG. 2. Specimen of *Oropogon loxensis* in the Botanisches Institut, Strassburg; perhaps the type.

DIAGNOSIS: *Thallus* caespitose or prostrate, brown, subrigid, branches nitidous, dichotomous. Spore 1, muriform.

DESCRIPTION: typical: *Thallus* caespitose or prostrate, filamentous, slender, subrigid, brown to light brown, commonly blackening; branches terete to subterete; *cortex* glabrous or nitidous, occasionally rimulose; *primary branches* dichotomous, flexuous, entangled (max. length 15 cm.); *secondary branches* dichotomous, flexuous; *fibrils* short, furcate. *Apothecia* lateral, common, small (max. diameter 2 mm.), concave, convex, or applanate, innate-marginate, disk concolorous, chestnut or dark brown. *Spores* 55–134 × 28–48 μ.

SUBSTRATA: The plant is reported to grow both on the ground and on trees; but the collector's labels that I have examined are without data in regard to the substratum (see Hue, Lich. Ext. Europ. 95. 1901).

GEOGRAPHICAL DISTRIBUTION: Confined within our area to the alpine regions of Mexico. It has been collected on Mt. Orizaba, and at Neveria and Alvarez. Outside of Mexico it has been collected in Japan, China and Java, in Peru and Colombia, South America, and on the island of Jamaica (Merrill, Bryl. **14**: 37. 1911).

OBSERVATIONS: A subspecies was proposed by Nylander, *i. e.*, *Al. Loxensis* var. *atroalbicans* (Lich. Novo Gran. Prod., Act. Soc. Sci. Fenn. **7**: 20. 1863). It is simply a color form described as follows: "thallo proparte nigricante et pro maxime parte albicante." The type No. 2746, collected by Lindig at Choachi, Colombia, is now in the herbarium of the Museum d'histoire naturelle, Paris.

### SPECIMENS EXAMINED

Sprague Herbarium, Boston Society of Natural History.

MEXICO: Mt. Orizaba, *Fr. Muller.*

U. S. National Herbarium, Washington.

MEXICO: Alvarez, San Luis Potosi, 8,999 ft., Sept. 1902, *Ed. Palmer.*

British Museum of Natural History, London.

COLOMBIA: Bogota.

Museum d'histoire naturelle, Paris.

L'AMERIQUE EQUATORIALE, M. A. Bonpland.

PERU: 1839–40, *M. Cl. Gay;* Carabaya, Juin-Juillet, 1847, *M. H. Alg. Weddell;* Sachapata, *W. Lechler,* 2 specimens cited by Nylander, and M. l'Abbe Hue.

MEXICO: Mt. Orizaba, 1858, *Fr. Muller.*

COLOMBIA, 3000 m., 1860, *Lindig.*

Botanisches Institut, Strassburg.

PERU: Sachapata, *W. Lechler.*

THOREAU MUSEUM NATURAL HISTORY,
CONCORD, MASSACHUSETTS.

## NEWS AND NOTES

Dr. F. H. Blodgett, formerly a student at the Garden, has been recently appointed plant pathologist at the Texas Experiment Station.

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Two additional plant pathologists, F. D. Bailey and H. L. Rees, have been called to the Oregon Experiment Station at Corvallis.

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An important contribution to the subject of forest tree diseases, by G. G. Hedgcock, appeared in *Phytopathology* for April, 1912.

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Dr. H. D. House has presented to the Garden a collection of 163 numbers of fleshy and woody fungi secured by him in the forests of Germany during the autumn of 1911.

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Professor L. H. Pennington, of Syracuse University, spent the Easter holidays at the Garden studying the genus *Marasmius*, in preparation of a monograph on the subject for NORTH AMERICAN FLORA.

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The large and valuable collection of unpublished drawings and descriptions left by the late Professor H. von Post, of Upsala, Sweden, has been presented to the Riksmuseum in Stockholm.

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The relationship of *Diaporthe parasitica* to other fungi is discussed by C. L. Shear in the April number of *Phytopathology*. The author hopes to clear up a number of difficult questions in this connection during the coming summer.

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Miss Adeline Ames, a graduate student at Cornell University, spent the month of February at the Garden studying the collection of Polyporaceae with special reference to the species occurring in the United States.

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The collection of gill-fungi belonging to the herbarium of Stanford University, California, has been sent to the Garden for

study. A large number of duplicates will be retained and added to the mycological herbarium.

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A collection of fleshy fungi from Sendai, Japan, has been received from Professor A. Yasuda. This is of special interest in connection with the study of species found on the Pacific coast, and may aid in determining the relationships existing between our far western flora and that of certain parts of Asia.

Cultivating *Pleurotus sapidus*.

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Dr. C. L. Shear, of the Department of Agriculture, Washington, D. C., visited the Garden April 3 on his way to Europe to spend about four months in various public and private herbaria studying the types of fungi causing fruit diseases. It is necessary to seek out the types of these diseases before the new quarantine law becomes effective in this country.

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We learn from *Science* that Dr. R. A. Pearson, recently Commissioner of Agriculture for the state of New York, has accepted the presidency of the Iowa State College of Agriculture at Ames. Dr. Pearson has been granted leave of absence for the summer and will visit agricultural colleges in Europe.

Dr. F. M. Bauer, Superintendent of the Metropolitan Hospital on Blackwell's Island in this city, has given us an interesting account of an experiment he tried last summer in moving an old deciduous stump from the upper part of the island to the Metropolitan grounds for the purpose of encouraging the growth of *Pleurotus sapidus* found upon it. Two or three weeks after transplanting, the mushroom fruited and yielded five crops in succession, the last one on December 17, when the accompanying photograph was taken by Dr. Bauer. Plenty of water was provided during the drought, and old blankets were spread over the stump during cold nights.

# INDEX TO AMERICAN MYCOLOGICAL LITERATURE

This index is prepared by Mr. B. O. Dodge, of Columbia University, and covers the same scope for the fungi as that covered by the general index published monthly in the Bulletin of the Torrey Botanical Club. It is not reprinted on cards for distribution.

**Arthur, J. C.** Cultures of Uredineae in 1910. Mycologia **4**: 7–33. 6 Ja 1912.

—— Cultures of Uredineae in 1911. Mycologia **4**: 49–65. Mr 1912.

**Claassen, E.** Plants not recorded in the Ohio list from Cuyahoga and Lake Counties. Ohio Nat. **12**: 471. F 1912.

—— Plants recognized on a dumping ground at the foot of Ninth Street, Cleveland, Ohio. Ohio Nat. **12**: 475, 476. F 1912.

**Coker, W. C., & Hyman, O. W.** *Thraustotheca clavata.* Mycologia **4**: 87–90. *pl. 63.* Mr 1912.

**Demaree, J. B.** A *Sclerotinia* on apple. Science II. **35**: 77, 78. 12 Ja 1912.

**Eastman, J. W.** The Myxomycetes or slime-moulds of the Ottawa district; a preliminary list. Ottawa Nat. **25**: 157–163. 12 F 1912.

**Edgerton, C. W.** *Botryosphaeria* on cotton bolls. Mycologia **4**: 34–36. 6 Ja 1912.

—— Flower infection with cotton boll rots. Phytopathology **2**: 23–27. *pl. 2.* F 1912.

**Fullmer, E. L.** A preliminary list of the Myxomycetes of Cedar Point. Ohio Nat. **12**: 472. F 1912.

**Heald, F. D.** Notes on new or little-known plant diseases in North America for the year 1910. Phytopathology **2**: 5–22. F 1912.

—— **& Wolf, F. A.** A plant disease survey in the vicinity of San Antonio, Texas. U. S. Dept. Agr. Plant. Ind. Bull. **226**: 11–129. *pl. 1–19 + f. 1, 2.* 24 Ja 1912.

**Johnston, J. R.** The history and cause of the cocoanut bud-rot. U. S. Dept. Agr. Plant Ind. Bull. **228**: 5–175. *pl. 1–14* + *f. 1–10.* 5 F 1912.

**Lewis, I. M.** A black knot disease of *Dianthera americana* L. Mycologia **4**: 66–70. *pl. 58–61.* Mr 1912.

**Macbride, T. H.** Notes on Iowa Saprophytes—I. *Geaster minimus* Schw. and its relatives. Mycologia **4**: 84–86. *pl. 62.* Mr 1912.

**Manson, M.** The chestnut tree disease. Science II. **35**: 269, 270. 16 F 1912.

**McCormick, F. A.** Development of the zygospore of *Rhizopus nigricans.* Bot. Gaz. **53**: 67, 68. 17 Ja 1912.

**Murrill, W. A.** Illustrations of fungi—X. Mycologia **4**: 1–6. 6 Ja 1912.

—— The Agaricaceae of Tropical North America—V. Mycologia **4**: 72–83. Mr 1912.

—— The chestnut canker convention. Jour. N. Y. Bot. Gard. **13**: 41–44. Mr 1912.

—— Collecting fungi on the Pacific Coast. Jour. N. Y. Bot. Gard. **13**: 1–14. *pl. 85–90.* Ja 1912.

—— Polyporaceae and Boletaceae of the Pacific Coast. Mycologia **4**: 91–100. Mr 1912.

**Rankin, W. H.** *Sclerotinia Panacis* sp. nov., the cause of a root rot of ginseng. Phytopathology **2**: 28–31. *pl. 3.* [Illust.] F 1912.

**Rehm, H.** Ascomycetes Exs. Fasc. 49. Ann. Myc. **10**: 54–59. 1 F 1912.

**Seaver, F. J.** The genus *Lamprospora,* with descriptions of two new species. Mycologia **4**: 45–48. *pl. 57.* Mr 1912.

—— Studies in pyrophilous fungi—III. The viability of the spores of *Pyronema.* Bull. Torrey Club **39**: 63–67. *pl. 4.* Mr 1912.

**Sherman, J. W.** Morels in October in Massachusetts. Rhodora **14**: 53, 54. Mr 1912.

**Smith, E. F.** On some resemblances of crown-gall to human cancer. Science II. **35**: 161–172. 2 F 1912.

**Sydow, H. & P.** Nova fungorum species—VII. Ann. Myc. **10**: 77–85. [Illust.] 1 F 1912.

**Theissen, F.** Fragmenta brasilica IV nebst Bermerkungen über einige andere Asterina Arten. Ann.Myc. **10**: 1–32. [Illust.] 1 F 1912.

**Wolf, F. A.** The brown leaf-spot of Colt's foot, *Tussilago Farfara* L. Ann. Myc. **10**: 65–67. [Illust.] 1 F 1912.

—— Some fungous diseases of the prickly pear, *Opuntia Lindheimeri* Engelm. Ann. Myc. **10**: 113–134. *pl. 1–3 + f. 1–8.* 1 Ap 1912.

—— Spore formation in *Podospora anserina* (Rabh.) Winter. Ann. Myc. **10**: 60–64. [Illust.] 1 F 1912.